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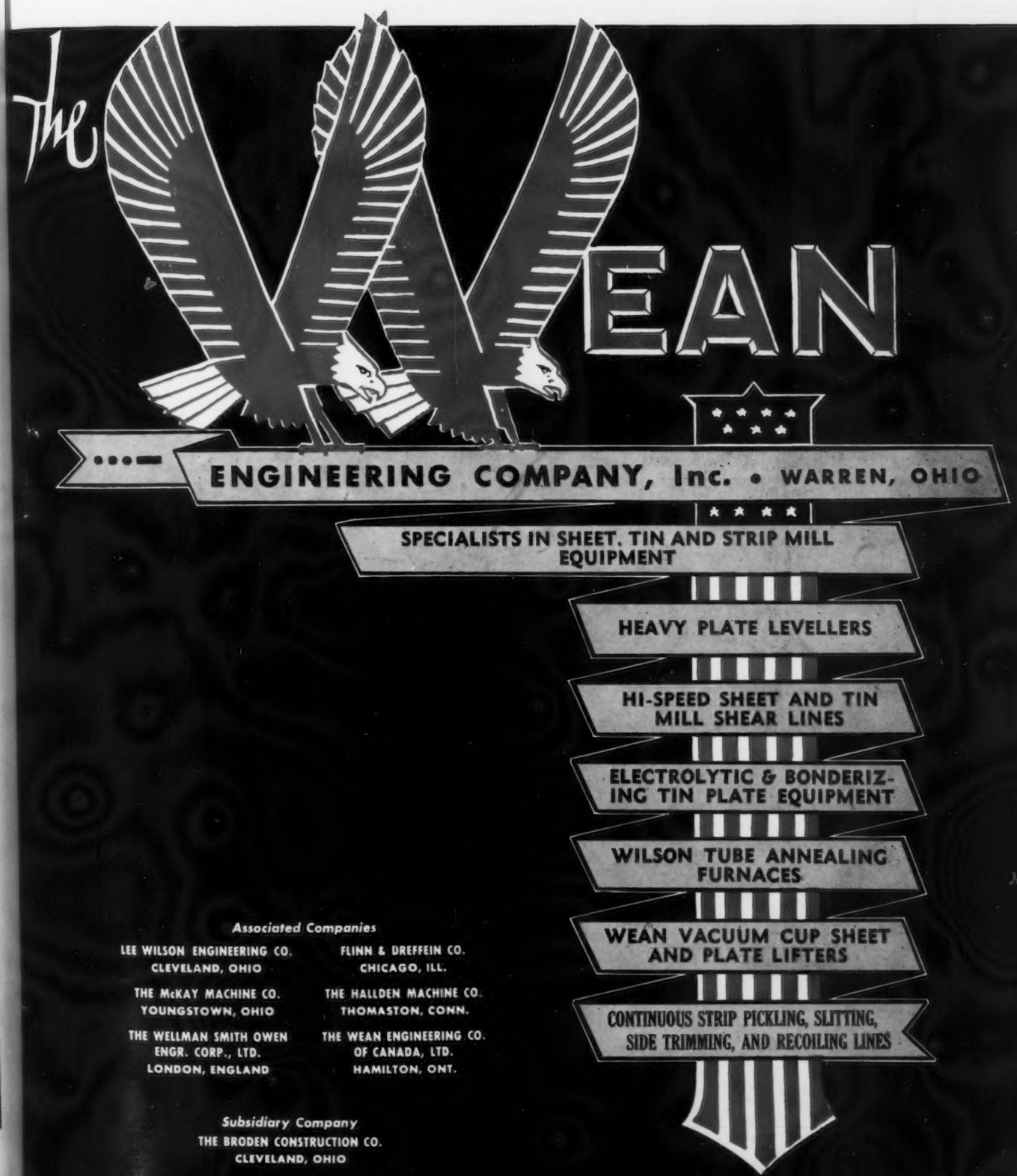
The IRON AGE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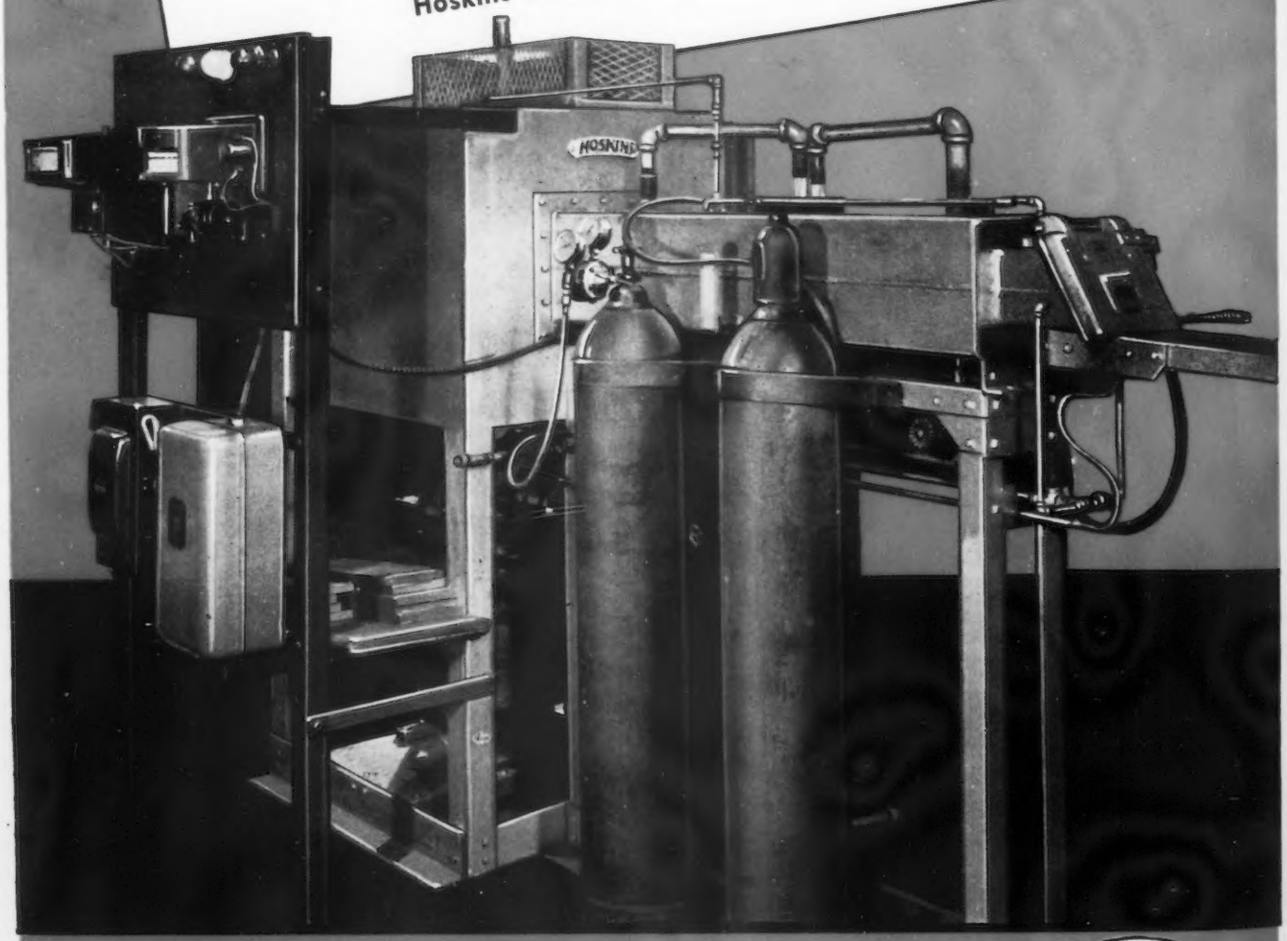

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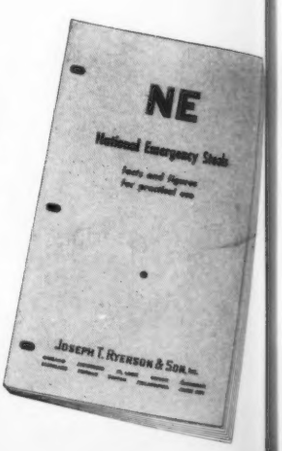

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THE IRON AGE

JANUARY 28, 1943

ESTABLISHED 1855

"One Million Workers on Strike"

SUPPOSE you read in your newspaper tomorrow morning that a million men and women workers had gone out on strike. That every mechanic, laborer and white collar employee in the city of Detroit and vicinity had dropped his tools and gone on a sit-down strike or that every man and woman in all of the plants in our great steel industry had taken indefinite French leave from their war jobs.

What a headline that would make! And what a hole it would make too in our industrial war program.

If that happened it would not take the authorities more than five minutes to do something about it. The people would rise up in wrath and demand of the ones responsible that they cease immediately soldiering for Hitler and Hirohito. It would cause a thousand times more public resentment than the recent walk out of a few thousand coal miners.

If such a situation existed and union leadership was strong enough to say to Uncle Sam: "Leave it to us; these men and women who are shirking their patriotic duty shall go back to work at once, or else." What a boost that would give union leadership in public opinion.

Such a situation actually exists in effect, believe it or not. More than a million workers in American industry are out on sit downs every working day of the year except possibly on pay day. These sit downs go unnoticed because they are not labeled as strikes. They are not called out to adjust grievances and they are not contemplated in one industry or community but spread over our entire industrial structure. They are the result of individual absenteeism. Collectively they do our war program more harm and our Axis adversaries more good than any strike that possibly could take place.

Absenteeism at a moderate estimate averages fully 15 per cent of our daily total labor in American industry.

A certain percentage of absenteeism is normal and unavoidable. People catch colds; have to attend funerals, or face other emergency situations where staying away from work is legitimate. But certainly the legitimate factor would not exceed five per cent. Anything above that is sabotage.

What is being done about it? The employer cannot do much about it. If he fires a man for absenteeism, he is likely to meet up eventually with the War Labor Board and most employers want to stay as far away from that body as possible. I think it is the responsibility of union leadership to handle this situation. They have been given plenty of power to do it. They can revoke a union card; the employer cannot. They can recommend in extreme cases that the malingerer be reclassified for draft; the employer cannot.

Here is a chance for union leadership to do a public service that will resound to its credit and offset some of the rising tide of public resentment to power without responsibility.

In six months intelligent leadership directed to this end could add eight million man hours per day to our war production. And that would nearly solve the manpower shortage.

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Production of Slender Parts on Swiss Type Automatics

By FRANK J. OLIVER
Technical Editor, THE IRON AGE

. . . Originally developed for the clock and watch manufacturing trade in Switzerland, the Americanized Swiss-type precision "automatic" is finding a new place in this country because of the impetus given to the demand for small, finely finished parts in the war program. This type of single spindle machine is particularly adapted to the turning of pinion blanks, shafts and small slender parts used in clocks, electric meters, radio equipment, striker pins, detonators, fuse elements and precision instruments for aircraft, artillery and naval use.

BASICALLY, the difference between a Swiss type automatic and a turret type single spindle automatic screw machine is that the stock is not only rotated to give the "speed" function, but is also fed axially during the cut so as to provide the longitudinal component of the feed. The single point turning and forming tools are provided with infeed only, and in order to provide for four or five tools in a single work plane, they are disposed radially in the upper half of a semicircle, Fig. 1. Accurate dimensional control is aided by using centerless ground stock and feeding it through a bushing whose outer face is just a few thousandths of an inch away from the plane of the cutting tools. An end working attachment provides for spotting, drilling and threading of one diameter. The work is fed through the guide bushing to the tools by a sliding headstock which contains the collet chuck and all movements of the headstock and tools are controlled by cams. Such a set-up does not necessitate the use of any broad form tools. By a combination of headstock and tool movements, any taper or form can be produced without form tools, simply by varying the radial infeed of a particular tool with reference to the stock feed. All tool holders are provided with micrometer adjustments permitting the individual adjustment of all tools both radially and parallel to the axis of the work.

Usually single point tools are employed and because of the unique design of the machine, there is almost no limitation to the scope of the back shoulder work, and even back recessing which can be done. Many parts, including those incorporating a pivot point, can be finished in the cut-off, thereby eliminating the need for second operations. Fig. 2 gives an idea of the class of work handled on the Swiss type machines. Most of them represent long, slender pieces used in instruments of various kinds.

Capacities 5/32 to 1/2 In.

As made in Switzerland, standard capacity of these machines was from 4 mm. (5/32 in.) up to 30 mm. (1 1/16 in.). The most popular size exported was 7 mm. (9/32 in.). In this country, 5/32, 3/8, 7/16 and 1/2 in. capacity machines are being built. The machines show up to best advantage competitively on smaller diameter work of a complicated nature. Fig. 3, for example, shows a small stainless steel instrument pinion produced in one set-up on a five-tool 1/2 in. Wickman machine. With its seven different diameters and five "necks," it would be an impossible job to accomplish in one set-up on a turret type machine. Actually this piece was being turned out previously by first pointing the ends in a single spindle automatic and then performing the additional operations in 13 separate set-ups in precision bench lathes. Time of 4 min. 36 sec. per piece in the Wickman machine looks high at first glance when one is thinking in terms of simple screw machine work, but compared to the time taken on the bench lathes, it represents a tremendous gain in output per hour.

The principal advantages of the small 5/32 in. machine are higher spindle speeds and smaller working parts which permit closer running tolerances and, therefore, produce components to greater limits of accuracy. Also, it is much easier to set up and handle the smaller machine on small work. Tool setting and other adjustments may be made with greater delicacy and dimensional stability maintained by being able to use the proper speeds and feeds on the smaller parts to be produced.

Whereas the 1/2-in. machine permits a maximum turning length of 4 in. or more, the machine with 5/32 in. chuck capacity is used only for the production of parts up to

1 9/16 in. long. These are the extremely small, highly accurate parts required in the manufacture of precision instruments, watches, etc. The actual forms produced, in many cases, can be clearly perceived only when the parts are placed under a magnifying glass. As with the larger machine, components which have pivot points, back shoulders, multiple diameters, tapers, bevels, etc., may be produced in a single operation. The accuracy, finish and concentricity of the finished parts are of such a high degree that secondary machining operations are practically eliminated.

Long Cycles

Whereas it is not unusual to turn out small screw machine products of a simple nature in 5 to 15 sec. on the former, cycle times on the Swiss machine range from 1 sec. up to as much as 8 or 9 min. An average time is 1 min. It should be understood, however, that much of this work taking a relatively long time is of a difficult nature and either could not be handled at all on a conventional automatic or would involve second-operation work. With these machines for example, it is possible to turn a piece several inches long from stock size of only 0.025 in. and such a piece might have a section at one end only 0.012 in. in diameter and ½ in. long. As a demonstration stunt, one of the American builders of Swiss type automatic successfully turned a pin 0.005 in. in diameter and 1 in. long. In regular production in instrument plants, tapered pivot points 0.013 to 0.018 in. diameter are being turned to size within 0.0003 in. of size.

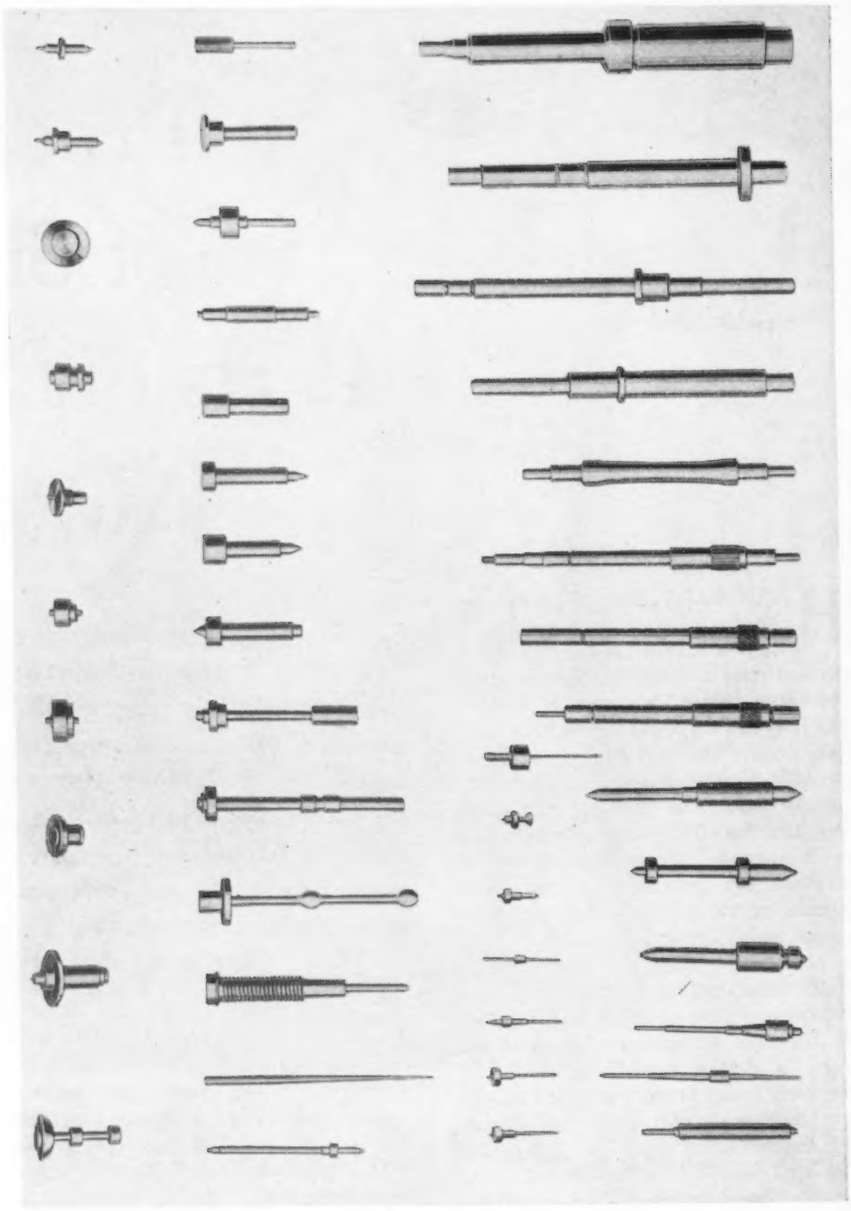

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FIG. 2—A few of the many types of small instrument parts which have been produced on Swiss type automatics in one operation.

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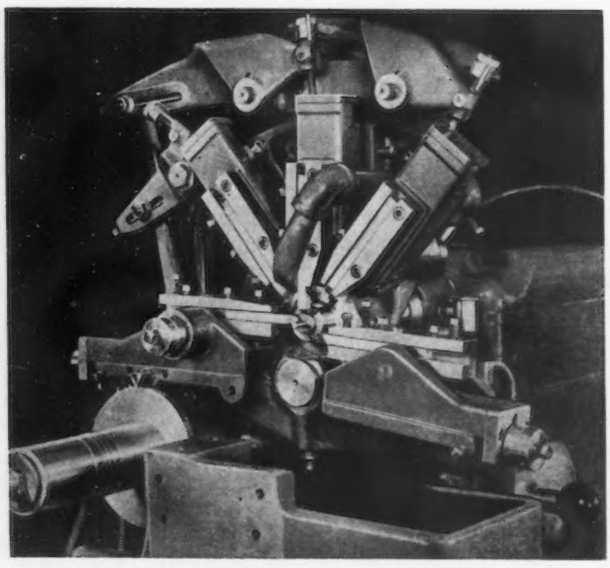

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FIG. 1—Radial arrangement of the tools in a Swiss type automatic. The two lowest tools are mounted on a single rocker arm pivoted about a stud directly below the support bushing through which the work is pushed. The rocker arm cam may be seen at the left. (Gorton machine.)

Jobs that are turned out extremely rapidly are accomplished by feeding out and cutting off three or four pieces with one collet gripping, thus reducing the non-productive time.

Where a number of different diameters are to be turned and particularly where step-back diameters are necessary, the only possible way to handle such cuts on a turret type machine (in which the stock is first fed out to a fixed stop) is by a broad faced form tool, either circular or dovetail. Such tools, however, impose heavy cutting forces on the stock, since the "depth" of cut is equal to the width of such tools. This rules out their applica-

tion on long, slender parts or where the deflection of the work under load would make it impossible to meet the tolerances called for. On somewhat heavier work, on the other hand, in a conventional automatic it is possible to use one of the turret stations for a back rest support for the end of long pieces.

With the Swiss type automatic, even in the most intricate forms and smallest diameters, it is possible to hold critical dimensions within 0.0002 in. of specified size. This is attributable to the rigid support given the work right next to where the cutting tool load is applied. Single point turning tools are at work and the feeds are light compared with cuts taken with bar turners, for example, in conventional screw machines.

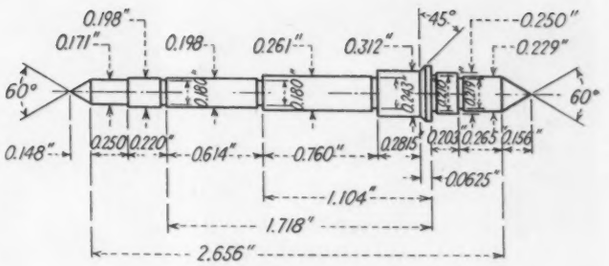

FIG. 3—A difficult job like this, with many different diameters and necks between them is typical of the type of work that can be handled in one operation on a Swiss type machine. (Wickman sample.)

Material-Stainless steel
Spindle speed-1127 r.p.m.
Surface speed-105 f.p.m.
Production-4 min. 36 sec. per piece
Production-11 per hour at 80% efficiency

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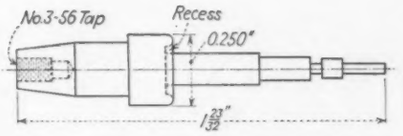


FIG. 4—Example of back recessing on a small part. This is accomplished by back tracking on the headstock and stock feed for the interval necessary.

Tapers or Curves Generated

Due to the radial feed of the tools it is readily possible to turn a piece with a raised shoulder in the middle simply by dropping the tool back to the lower diameter after the stock has been fed past the shoulder portion. By suitable camming, it is also possible so to govern the radial infeed with relation to the stock feed that a taper of any angle or even a curve, like a portion of a sphere, can be generated by a single point tool. This compares with cutting of tapers with a swing tool in the turret of a conventional single spindle automatic.

By proper camming of the headstock feed, it is also possible to retract the headstock at any point without releasing the collect chuck so as to produce an undercut or back recess, such as is illustrated in Fig. 4.

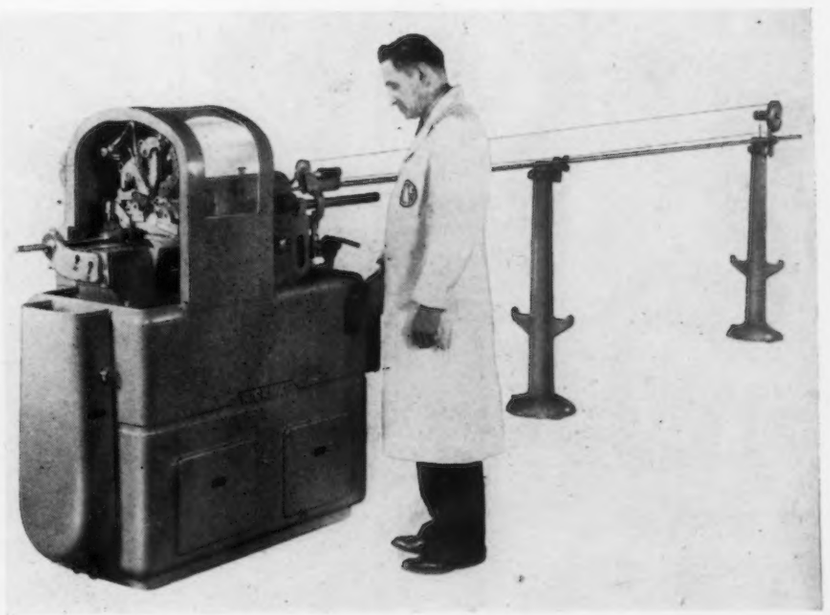
Drilling and tapping or threading operations can be performed on the end of the piece, through the medium of an end working attachment. There are these differences to be noted from conventional machines:

In the first place, the device is limited to drilling two diameters or to drilling one hole and then tapping it. It is possible to thread one diameter with the end attachment and to thread a second diameter with a thread roll tool in one of the radial tool holders. During drilling and threading operations, the headstock feed usually remains stationary. Provision can be made for step drilling deep holes, simply by arranging pull-outs on the cam which controls infeed of the end tools. Usually solid, acorn type or adjustable chaser dies are used so that the relative motion of the die must be reversed, although self-opening dies have been applied.

Tap Reversal

The headstock spindle has only one direction of rotation, and screwing and unscrewing in the Swiss type machines is done by the differential system of over and under-speeding in the following manner: Suppose the main drive spindle machine rotates at 7000 r.pm. To thread on, the die spindle is rotated at 9000 r.pm., in the same direction, giving a relative threading speed of 2000 r.pm. A second pulley on the attachment rotates at 5000 r.pm. A double taper friction clutch allows one pulley to be declutched and the other engaged instantly. In the example cited, the solid or acorn die backs out at 2000 r.pm. due to overrunning of the work. An alternative method on real small work is to apply a brake to

FIG. 5—The Wickman machine departs farthest from the original Swiss designs in view of its British-Swiss parentage.



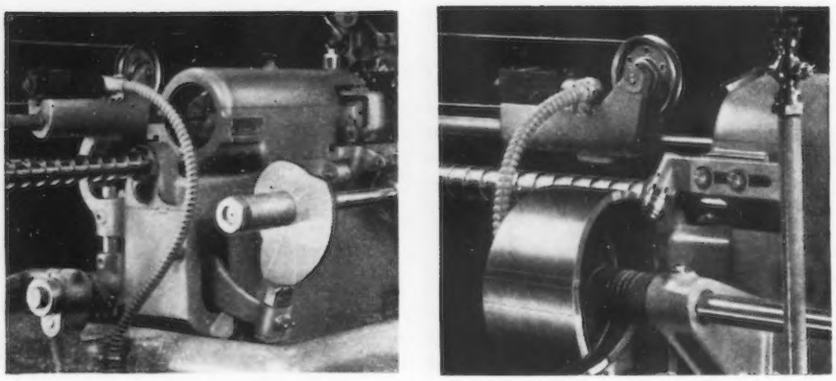


FIG. 6—Headstock cams for the Wickman automatic. These are typical of other designs as far as the cams are concerned.

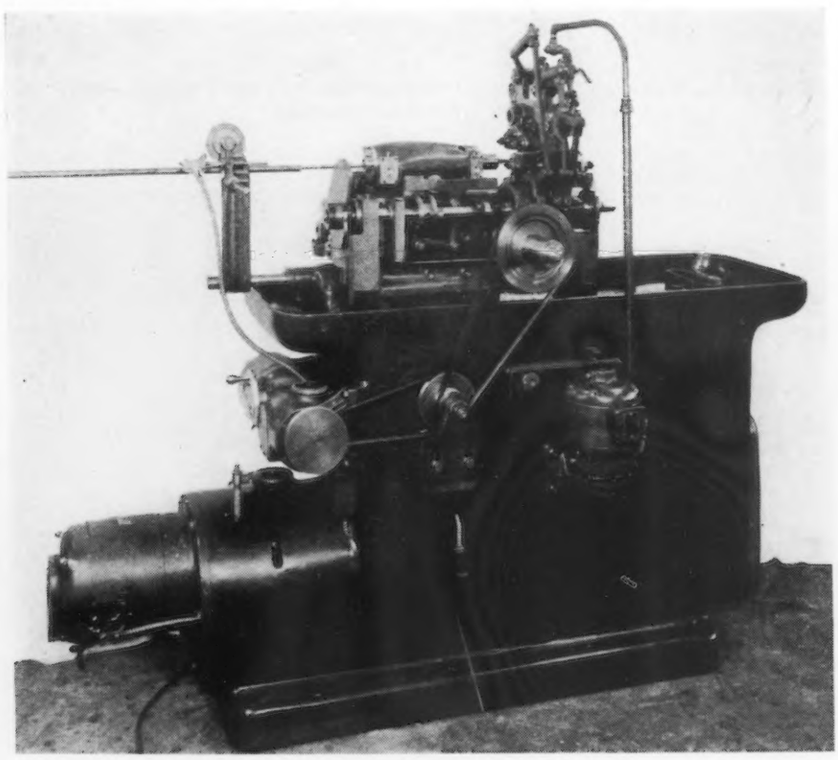
the tapping spindle, in which case the backing out speed is even faster. When self-opening die heads are used, only one speed (fast) need be used for threading on.

Lead screws are not employed for the threading attachment. The cam starts the die or tap on the stock for a few turns and then allows the threading tool to follow its own lead.

Usually these end working attachments have two of the three spindles geared together, and the three are successively rocked into position. The first spindle usually carries a stationary spotting tool or start-drill. The second spindle is for drilling and the third for threading, either external or internal. Deep holes can be drilled with three or four pullouts to clear chips from the hole.

Small drills are driven at high speed in order to get the proper peripheral speed for efficient cutting. This is accomplished by driving the attachment spindle in a reverse direction from the work spindle so that relative to one another the two speeds are added. This is readily obtained by gearing the drilling and tapping spindles together.

FIG. 7—Rear view of the latest type Ceco machine, showing the large headstock plate cam overhanging the end of the bed and the separate motor drive for the cam shaft.



Feeds Are Light

Feeds on these Swiss type automatics are generally light, as compared with the feed for box tools on the turret of a conventional automatic. They are more nearly comparable with the feed on a circular form tool which must necessarily be low because for straight infeed the depth of cut equals the width of the tool. When turning stainless steel, for example, feeds for forming cuts range between 0.0003 and 0.0005 in. per rev. and for straight turning operations 0.0002 to 0.0007 in. per rev. Cold drawn steel and non-ferrous stock can be turned at much greater feeds, depending upon the finish and accuracy desired. In fact, as in any machining operation, choice of feed is largely governed by the finish required. On diameters that are later to be ground, the turned finish is immaterial and high feeds can be used.

When form tools are used on the cross slides of a conventional automatic, stops are used to limit the amount of infeed and hence to control the diameter of the work irrespective of any slight errors in cam profile. Except on the rocker tools, it is not possible to provide such depth control on the Swiss type machines. Instead, diameter control is definitely a function of cam accuracy. Generally, however, each radial tool turns only one diameter and as a partial compensation, each radial tool slide is provided with a micrometer adjustment to correct slight errors in base diameter.

As will be seen in a later article, equipment has been developed abroad for the accurate milling of cams and American copies are now on the market. A technique also has been devised for checking cam contours by a special micrometer. In addition, the leverage ratio between tool feed and cam rise and fall is 3:1 or 2:1 on many of the radial tools, so that radial errors in cam profile are halved at the tool. On some machines, these ratios can be varied, allowing modification of the cam rises. The answer to inherent accuracy, however, is that experience shows that even on very small diameters (0.012 in.) the dimension can be held within two to three "tenths." Size accuracy and fine finish are favored by the use of light cuts and slow feeds.

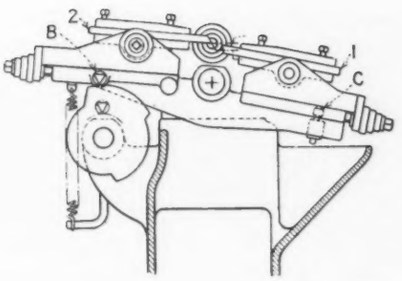


FIG. 8—How the rocker tools are operated by a single cam. When the front tool is rocked into position, the rear tool is withdrawn. See also Fig. 1.

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The original Swiss machines that were imported into this country, prior to the war, were all very much alike as to mechanical details. In the first place, the three principal "makes"—the Petermann, the Bechler and the Tornos—were all manufactured in the same town of Moutier, Switzerland, and many of the workers have been employed by all three companies at one time or another.

Changes in American Models

In addition an American version of the Wickman Swiss type automatic is being made in this country, Fig. 5. It departs farthest from the original Swiss design in view of its more immediate ancestor, a British model (A. C. Wickman, Ltd.).

Now that these machines are being made in this country, many design details have been incorporated in line with best American machine tool practice. They all necessarily conform to the basic principle of stock feed through a bushing and radial tool feed in a fixed plane that distinguishes this type of automatic. The chief changes have been made in the drive means, use of heavier construction, cleaner lines and refinements in attachments, such as in the end feeding attachment and in the slotting attachment. Some are using a separate motor for the cam shaft drive (the Swiss machines have a single motor drive) and several of the American models incorporate variable speed drives. Anti-friction bearings have been added in some places. Some of the drives for the slotting devices were particularly awkward on some of the Swiss machines.

The fact that Swiss machines were originally imported has complicated the marketing set-up further in that selling agents were already set up in this country and some still remain in the picture for marketing the American made models. The table on page 32 shows the genealogy of these machines and their American parents.

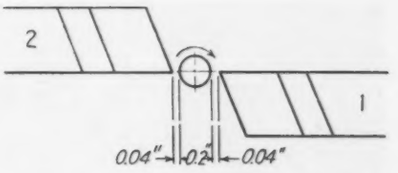

FIG. 9—In the medium position, both rocker tools, shown in Fig. 8, are clear of the work.

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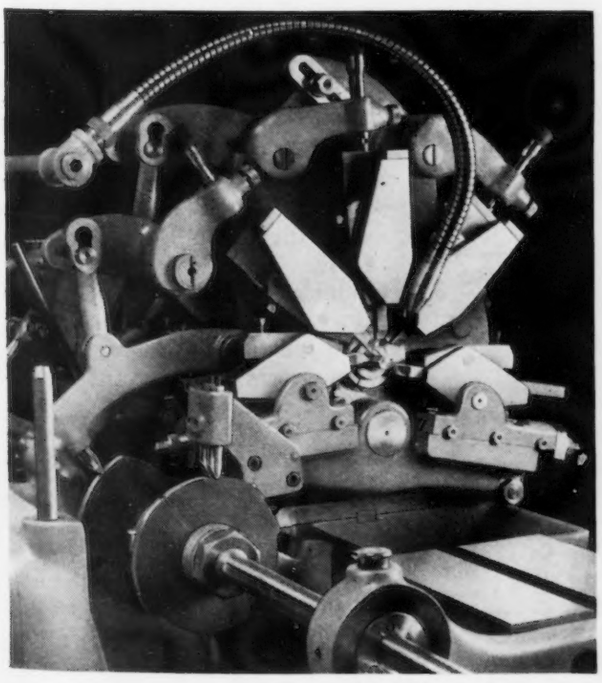
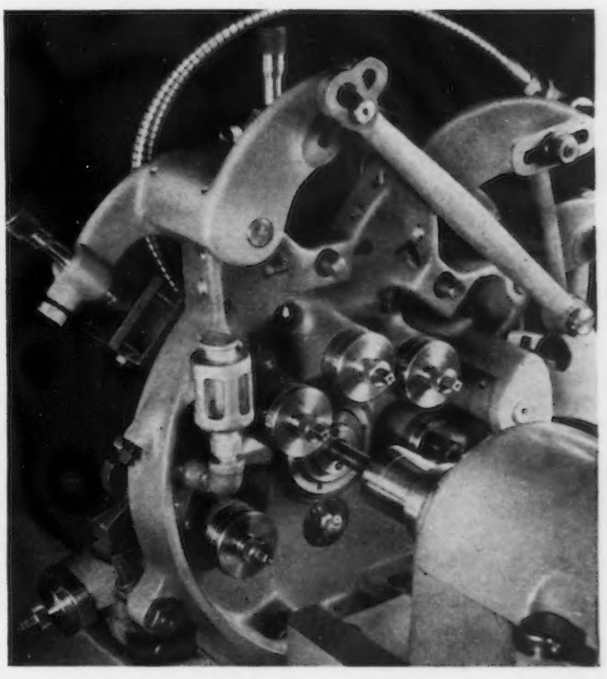
Swiss type automatics have only a single cam shaft, which carries, however, more cams than are found on a conventional single spindle automatic. There is one cam for tools Nos. 1 and 2 which are mounted on a common rocker arm, and each of the other tool slides (two or three) has its own cam. Headstock movement is controlled by a cam of either the disk or bell type, Fig. 6. A bell cam is also used for feeding the end tools on the attachment, and a flat cam is employed for indexing these tools. There is also a trip dog for belt shifting or clutch control for threading operations. (Over and under-speeding to get tap or die reversal.)

On the original Swiss machines, a flat headstock cam was employed where the work length ordinarily did not exceed 2¾ in. For lengths up to 4 in. a bell cam was invaria-

FIG. 10—Micrometer adjustments are provided for endwise (radial) and sidewise (axial) location of each tool. These photographs show front and rear views of the Wickman head.





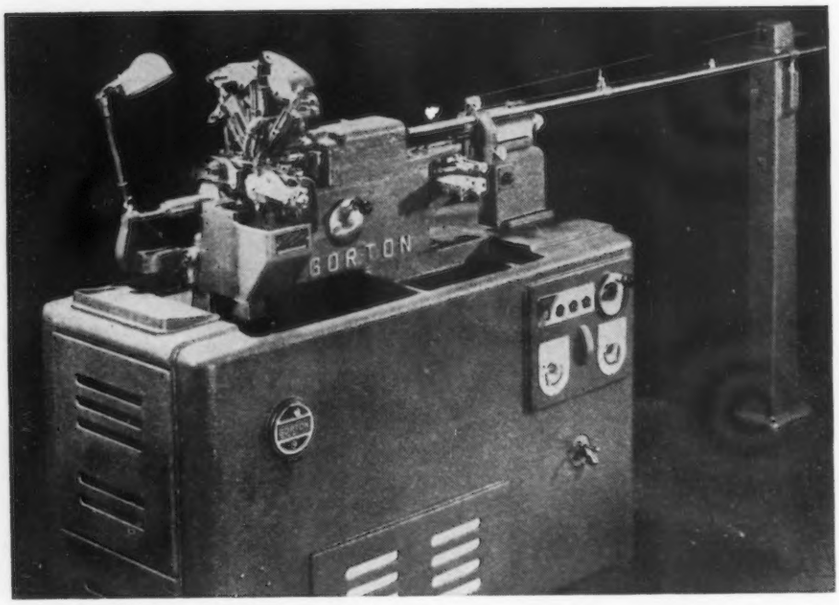


FIG. 11—Variable speed drives for headstock and crankshaft are provided on the Gorton-Petermann machine. Speed controls are centralized on the panel at the right.

bly employed. This practice is generally followed in the American models. If longer lengths are to be produced it is possible to release the collet, retract the headstock and feed forward again, thus practically doubling the work length capacity. The end feeding attachment must be used as a temporary stock stop while the collet is getting a "fresh grip" on the work. It is also possible to accomplish the same result with a shoulder cutting tool acting as a stock stop.

On the latest model Ceco machine, flat plate cams are used for headstock traverse on either long or short work. By letting this cam overhang the end of the bed, Fig. 7, it can be made as large as need be for long traverses. Primarily this change was made not to eliminate bell cams, which present no difficulty from the production angle, but to simplify the layout of the headstock cam, particularly for straight taper turning. In the original Swiss machines, rocker arms and bell cranks are used to translate the cam follower motion at right angles for headstock feed. Arc templates corresponding to rocker radii must be used for laying out cams ordinarily. In the Ceco unit, the effect of rocker arms has been eliminated by using straight line translation of movement from a plate cam.

Straight radial cam layout can be used. By letting this cam overhang the end of the machine, it can be made as large as need be and replaces a bell cam for long traverses. The cam follower is moved vertically in straight guides and bears on a roller at the end of a rocker arm. The other end of the arm bears in turn against a pivoted flat shoe, carried on the end of a bell crank. The other arm of the bell crank transmits its motion to a vertical slide bar on the headstock through a roller. This arrangement gives straight line translation of movement throughout.

Rocker Tools

Camming of the cutting tools is identical in all models, but feed for tools Nos. 1 and 2 is different from other tools in the head. It will be noted from Fig. 8 that these tools are mounted on a common rocking arm, the hardened pivot point of which is directly below the work bushing axis. When tool No. 2 is rocked into cutting position, tool No. 1 is backed away. Fig. 9 shows the medium position with both tools clear of the work by 0.020 in. A single cam controls the movement of the rocker arm and a coil spring holds the follower toe in engagement with the cam. Gorton plans a multiple camming device for the rocker tools so that the ratio of rocker cams can be varied.

Roller followers are not used on plate cams. Necessarily, movements of tool No. 1 (front rocker tool) are governed by the variations in the minimum radii of the cam, and those of tool No. 2 (rear rocker tool) by variations in the maximum radius. These rocker tools are generally selected to carry the heavier cutting loads and for multiple diameter camming.

Each tool is mounted on an auxiliary rocker for adjusting the tool on center. In addition, screws with micrometer dials are provided for adjusting the tool carriers radially and in the axial direction. In fact, as Fig. 10 shows, each tool holder has micrometer adjustments of this nature. As has been mentioned, radial control is to compensate for slight errors in base circle diameters of cams.

Radial Tools

Each of the upper radial cutting tools (Nos. 3, 4 and 5) are provided with individual cams, which are of the C-type so that they can be slipped over the camshaft between its support bearings and locked between collars tightened by

American Manufacturers of Original Swiss Automatics

Original Swiss Types	American Agent	American Maker
Bechler	Triplex Machine Tool Corp., New York	**City Engineering Co., Dayton, Ohio
Petermann	Russell, Holbrook & Henderson, Inc., New York	***Geo. Gorton Machine Co., Racine, Wis.
Tornos		
Wickman*	Wickman Corp., Detroit	Thomas B. Gibbs Co. Sheffield Corp., Dayton, Ohio

*British-Swiss origin (A. C. Wickman, Ltd., England)
** Bears the Ceco name
*** Bears the Gorton name

a spanner wrench. The cam followers or toes are pivot shaped and bear directly on the cam. Most followers are made of tool steel and are V-shaped. In the Wickman machine, they are tipped with a hard grade of carbide. Cams for the rocker operated tools are the solid type, on the other hand, since these tools carry the major portion of the cutting load. One or two cams may be used.

There are several variations to the method of transmitting the motions of the cam followers to the radial slides. In general, the mechanism involves a rocker arm on top, a pivoted link carrying the cam follower and a connecting rod. Shifting the upper end of the rod in a slot in the rocker arm allows the ratio of tool travel to cam travel to be varied from 1:1 up to 3:1, depending upon the type of machine. In this way standard cam motions can be modified to suit a variety of jobs within a limited range.

Since the followers are on pivoted arms, in laying out the cams, templates corresponding to the radius of the arms must be used in projecting the degree divisions on the periphery of the cam layout disk, in line with standard practice on conventional machines. It should be noted, however, that the cam plate is divided into 360 divisions instead of 100.

In this connection, it should be emphasized that cams must be laid out very accurately since the rise on the cam definitely determines work diameter. In a conventional automatic, where box tools are used on the turret, the diameter is governed by the tool setting. On a Swiss type automatic, even when a cam is generated perfectly and checks against a micrometer set-up, there may be variations in diameter of work. Some cams have to be taken back to the miller and smoothed up with a burnishing tool. This is one reason why the use of standard cams is desirable, once a good form is developed. It is also highly important that cylindrical portions of radial feed cams be concentric with the camshaft, otherwise a taper will develop in the work.

In one aircraft instrument plant, use of standard cams makes it possible to use Swiss automatics for as many as 1000 pieces, bettering the unit cost obtained on hand screw machines, including set-up time, etc.

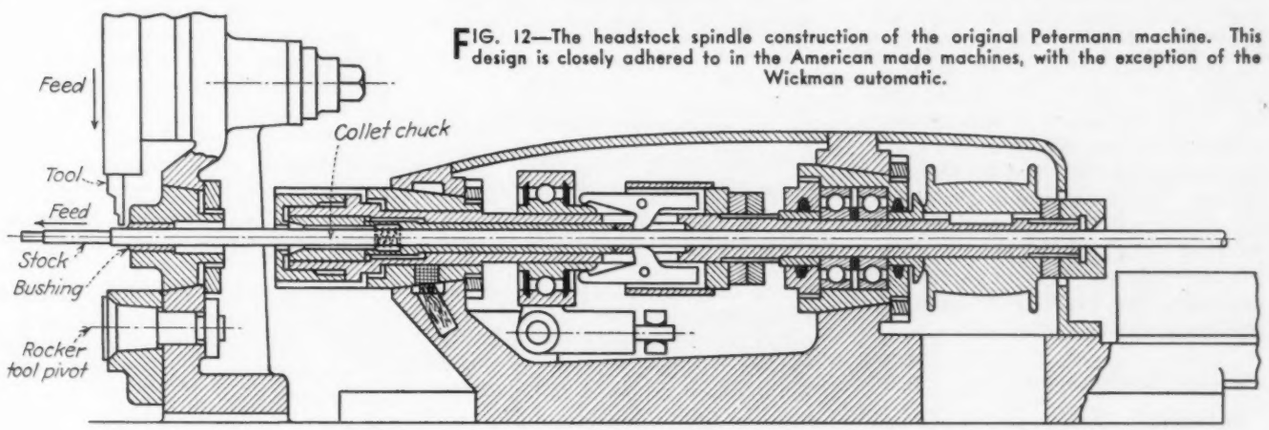


FIG. 12—The headstock spindle construction of the original Petermann machine. This design is closely adhered to in the American made machines, with the exception of the Wickman automatic.

On the Rolex mechanism (headstock feed lever system) of the Bechler machines used here, it is possible to vary the ratio of headstock travel to cam rise from 1:1 all the way up to 10:1, thereby taking care of a wide variety of lengths of work with a single cam. Necessarily, there is some loss in production time involved. Whereas with a modified standard cam, 320 pieces might be produced in an hour, with a cam specially cut for the purpose, 370 pieces, or 15 per cent more might be produced. Set-up time with standard cams is 1½ to 2 hr. On special jobs, set-up time is around 3 hr., not including the time to cut new cams, which takes about 24 hr. after they leave the "board."

Camshaft Drives

American builders have all improved upon the drive to the camshaft. While retaining the final worm and wheel drive, the original right angled "mule" drive arrangement with round belt has been replaced with either roller chain or V-belt. In the Gorton version, Fig. 11, for example, a separate 1/3-hp. motor is V-belted to a Graham variable speed reducer and the output shaft is connected to the worm-wheel shaft by roller chain. A knurled disk is used for obtaining speed variations and this protrudes through the control panel. A dial gage is hooked up mechanically with the control disk and reads either in r.p.m. or pieces per min. In the prototype Petermann machines, a single flange-mounted motor drives both headstock spindle and the camshaft.

Separate camshaft drive from a variable speed unit is also used on the Ceco machines. As the rear view of this machine shows, Fig. 6, the motor and Master "Speed Ranger" variable speed change unit are mounted above and at right angles to the main drive motor, permitting a simple two-stage V-belt drive to the camshaft worm.

On the Wickman machine, on the other hand, camshaft speed changes are made through change gears and power is transmitted from a constant speed shaft driven off the main spindle motor. A gear box is interposed, however, and provides gearing and clutches for accelerating the camshaft during idle movements of the tools. The accelerating mechanism by-passes the change gears and speeds up camshaft to 7 sec. cycle (1 rev. in 7 sec.) during the non-cutting periods. This is an advantage on long cycle jobs, where ordinarily 80 deg. of a 360-deg. cam circle is taken up with retraction of tools, opening of collet, advance of stock, closing of collet and withdrawal of cut-off tool to start of cutting operation before stock feed

takes place. It is also important where a long section of work is left unturned on ground rod stock. In this case the headstock can advance the stock rapidly during the non-cutting period.

Roller chain is used between the gear box and the wormwheel in this installation, also.

Both Ceco and Gorton use variable speed drives to the headstock spindle, the former through a Master unit and the latter through a Reeves drive. Both units drive a wide drum over which a flat driving belt travels during the feed of the headstock.

In the Wickman machine, spindle speed changes are accomplished by changing the outside pulleys on the main drive shaft and on the motor pulley, 28 speeds being obtainable in this manner. An ingenious arrangement of bearing retainer has been provided for using an endless belt on the inside drive drum without removing the shaft. The driven pulley on the headstock is ball bearing mounted independently of the spindle proper, which is driven through splines. The front end of the spindle is carried in a tapered bronze bearing which is lapped to close limits, while the rear is carried in preloaded ball bearings to take the thrust as well as radial loads.

Collet Operation

Stationary spring type collets operated by a sliding sleeve and fork are generally employed on these machines. Fig. 12 shows a cross-section of a Petermann spindle, which is also typical of present American designs. The shifting fork is controlled by a self-locking mechanism operated by trip dogs carried on a drum on the cam shaft. These dogs may be adjusted around the periphery of the drum and are similar in action to conventional clutch trip dogs. In the usual set-up on a Swiss type automatic, as the cut-off tool completes its operation, the collet is opened, permitting the stock to remain up against the cut-off tool as the headstock is withdrawn to the starting position. The collet is then tripped and the machine is ready for another cycle.

Stock Feed

In most designs, both foreign and domestic, stock is fed through a slotted tube by a gravity pusher finger. A weighted load is applied against the finger through an arrangement of flexible wire and pulleys. As the pusher nears the head-

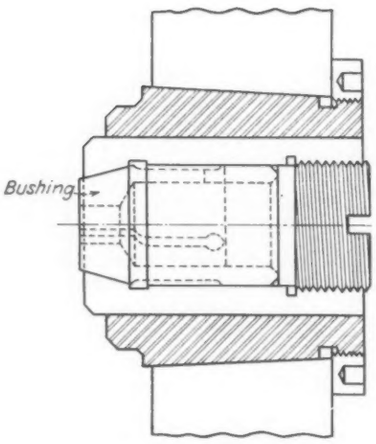


FIG. 13—Construction of stationary split type guide bushing (Wickman). It is mounted in the tool head on the spindle center in a split tapered bearing. A close running fit between stock and tool steel split collet is obtained through the adjusting screw at the right. Bushings can be had with carbide inserts for long wear life and closer adjustment.

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stock, it contacts a trip switch which stops the machine. On the Ceco machine, there is a double micro switch stock control. When the first switch is contacted by the pusher bar, it energizes a second switch which is then tripped by a dog on the collet control disk at the completion of a cycle on the piece. This prevents stopping the machine in the middle of a cycle.

In the Gorton version of the Petermann machine, a Lipe-Rollway air feed is used in place of a gravity stock feed. A tell-tale light is used in conjunction with a micro switch to warn of stock exhaustion.

It should be realized, of course, that the stock pusher becomes effective only when the collet is opened at the completion of a cycle and then it largely performs the function of holding the stock against

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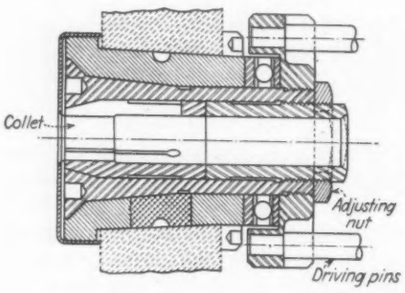
FIG. 14—Revolving type guide bushing. The Wickman design is typical of all Swiss type automatics. Wickman also supplied a self-adjusting style with coil spring tension.



the cut-off tool (which serves as a stop in most set-ups), while the headstock is withdrawn to starting position. Feed force for the headstock is applied through the headstock cam, and is aided by the feed weight.

Materials

In producing small diameter pieces on these machines, material specification has a definite bearing on the quality of finish and the accuracy obtained. That is why carbon drill rod (0.95-1.05 C) is frequently used for this purpose. Drill rod, in this instance, is bought in greater lengths than the standard 3-ft. sections, but the same tolerances of ±0.0005 in. for sizes from 0.125 to 0.500 in. and ±0.0003 for under 0.125 in. are called for. They are centerless ground to perfect roundness and to a polished finish. These materials should be free from surface decarburization and any flaws or inclusions. For this reason, rigid mill control of heats is specified. This is costly material. In the smaller sizes (0.013 to 0.016) the price runs around $35 a pound, without extras for length or special finish.

"Pinion stock" is commonly used for clock, meter and instrument parts. This material is similar to a bessemer screw stock, but tolerances and finish are identical with drill rod. In the war effort, a great deal of stainless steel rod is being turned on these Swiss type automatics. It presents no special problems, except that the feeds are necessarily lower. A number of nonferrous materials are also being machined, particularly aluminum and brass.

Fit in Bushing

The close diameter control of stock has a direct bearing on the accuracy of work performed in that it governs the fit or play of the stock in the guide bushing just back of the working plane of the tools. Although there may be size variations of ±0.0003 in. in any bundle of drill rods, any one rod will have the same diameter throughout. Hence on real fine work the bushing will be adjusted separately for each rod to give a push fit. The bushing is usually split in three sectors and is mounted in a collet type of holder, Fig. 13. While the standard bushing is made of hardened tool steel, some American builders are supplying bushings with hard carbide inserts for long wear. One

maker is using Ampco bronze. Because of their anti-weld properties, these inserts are particularly recommended when turning stainless steel or other "gummy" material that tends to smear on the bushing and result sometimes in complete seizure.

An alternate type of bushing for use with stainless steel or for stock that is out of round or is hexagon or other than round shape, is the revolving bushing, Fig. 14. A collet type bushing is employed here also. Wickman provides both a manually adjusted and a self-adjusting type, the former corresponding to original Swiss designs. In either type, a ball thrust bearing is needed, and positive rotation of the whole bushing is provided by a special driving plate mounted on the headstock spindle nose, drive being through two hardened and ground pins. Tension of the bushing collet against the stock in the self-adjusting type is maintained by helical spring pressure. This should be enough to prevent rotation but permit sliding. This sort of arrangement compensates for slight variations in diameter of cold rolled stock and obviates the need for specifying centerless ground stock.

Finely Ground Tools

Where fine finish and close diameter control is desired, it is necessary to use not only fine feeds, but also finely ground tools. For the average run of jobs, square stock high speed steel (5/16 in. max.) ground on all four sides aids in the precise setting of the tool bits in the holders. In addition, the faces and clearance angles are finely ground so as to leave clean, sharp edges. Usually the tools cut on center and no rake is employed. Corners are necessarily sharp for close shoulder work, and radii, if any, are of the nature of 0.010 to 0.015 in. In turning stainless steel, the wear on these corners is severe and this means the tools have to be pulled out and reground about every hour or two. Hence cemented carbide tools are being widely substituted for H.S.S. to obtain longer runs between grinds. These tools are invariably diamond lapped to a mirror finish.

One aircraft instrument plant uses carbide tools almost exclusively and runs the machines faster. A better finish is obtained on the work and longer tool life results. The tools are all carefully prepared by diamond lapping.

In a later article, tool layouts and camming of some typical instrument jobs will be discussed.

Rapid Heating for Propeller Forming

HEATING a propeller blade shank for two important forming operations is done in approximately one-fifth the time formerly required, by the "Tocco" electrical induction process developed by the Ohio Crankshaft Co., Cleveland. The shank of the hollow steel propeller blade is first heated preparatory to swaging, an operation in which the shank is rounded to a perfect circumference. The blade is mounted on a movable rack at the front of the 100-kw. Tocco machine, as shown in the photograph. The tubular shank section, 4⅝ in. in diameter, at the base of the blade is then moved forward until it is surrounded by the heat inductor coils of the unit.

When the operator presses the control button, electrical current of high frequency flows through the inductor coils, and about 12⅝ in. section of the steel propeller shank is heated to approximately 1700 deg. F. in 150 sec. When the correct temperature is reached, the operator hooks the blade on an overhead spring balance crane and conveys it to a large National 27-ton forging machine.

At the completion of the swaging operation, the blade passes through two welding processes, a thorough inspection and a lathe machining operation before it is again mounted on the movable rack and heated a second time in the electrical induction unit for 210 sec. to a temperature of about 2200 deg. F. When the proper heating is attained, the overhead crane again conveys the heated piece to the adjacent upsetting equipment in a few seconds.

The upsetting operation consists of forming the heated shank in a three-pass set of dies to increase the wall thickness of the shank from 0.520 in. to approximately 13/16 in. and to decrease the length of the shank area from 12⅝ in. to 9 3/16 in.

Propeller blade shank being heated to 2200 deg. F. in 210 sec., prior to upsetting.

Steel Carburization and

By JAMES K. STANLEY

Westinghouse Electric & Mfg. Co., East Pittsburgh

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THE reaction between methane* and iron is

$$CH_4 + Fe \rightleftarrows C_{(\text{in iron})} + 2\,H_2 \qquad (7)$$

The equilibrium constant for the above reaction is written:

$$K = \frac{(N_C)}{(N_{Fe})} \frac{(P_{H_2})^2}{(P_{CH_4})} \qquad (14)$$

**It is assumed here that higher hydrocarbons decompose according to the following reaction:*

$$C_nH_{2n+2} \rightleftarrows CH_4 + (n-1)C + (n-1)H_2 \qquad (13)$$

The methane-iron equilibrium has not received as much attention as the moncxide equilibrium. The work of Schenck[28] is perhaps outstanding. The Sykes[29] null method of studying the equilibrium between hydrogen - methane mixtures and iron is not a very sensitive one. He annealed sheets of various carbon contents at given temperatures and determined which mixtures of methane-hydrogen were neutral to the steel.

The constant for this reaction has been calculated from the data of Schenck and is given in Table III; it is plotted in Fig. 5. The mathematical expression for the change of K with temperature is written as:

$$\log_{10} K = 4.574 - 5309\left(\frac{1}{T}\right).$$

TABLE III
Equilibrium Constant of Equation

$$CH_4 + Fe \rightleftarrows C_{(\text{in Fe})} + 2H_2$$

$$\text{where } K = \left(\frac{N_C}{N_{Fe}}\right) \frac{(P_{H_2})^2}{(P_{CH_4})}$$

Temp., C.	1/T (Obs.)	K	$\log_{10}K$ Obs.	Calc.*
810	9.3×10^{-4}	0.40	−0.398	−0.363
825	9.1	0.53	−0.276	−0.257
850	8.9	0.73	−0.137	−0.151
875	8.7	0.98	−0.009	−0.045
900	8.5	1.03	+0.013	+0.061
925	8.3	1.53	+0.185	+0.168
950	8.2	1.65	+0.217	+0.221
1000	7.8	2.91	+0.464	+0.433

* Calculated from equation

$$\log_{10} K = 4.574 - 5309\left(\frac{1}{T}\right); T = °K$$

While Fig. 5 is important for expressing the variation of the equilibrium constant, its usefulness is not obvious without some study. A more useful plot is shown in Fig. 6 where the methane is plotted against carbon.

As the temperature is increased, the carbon content of steel in equilibrium with a given methane content is increased. Or, in other words, the mixture becomes more carburizing with increasing temperature as more methane is being decomposed to give carbon to the metal. This is true because methane is more stable at lower temperatures.

The effect of pressure on the methane-iron equilibrium is different from that of the carbon-monoxide-iron equilibrium. In the present case, one mol of methane decomposes into two mols of hydrogen, while in the former (monoxide) case, the two mols of monoxide decompose to one mol of carbon dioxide. This change in

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FIG. 5—Variation of equilibrium constant in CH_4-Fe reaction where $\log_{10}K = 4.574 - 5309\left(\frac{1}{T}\right)$.

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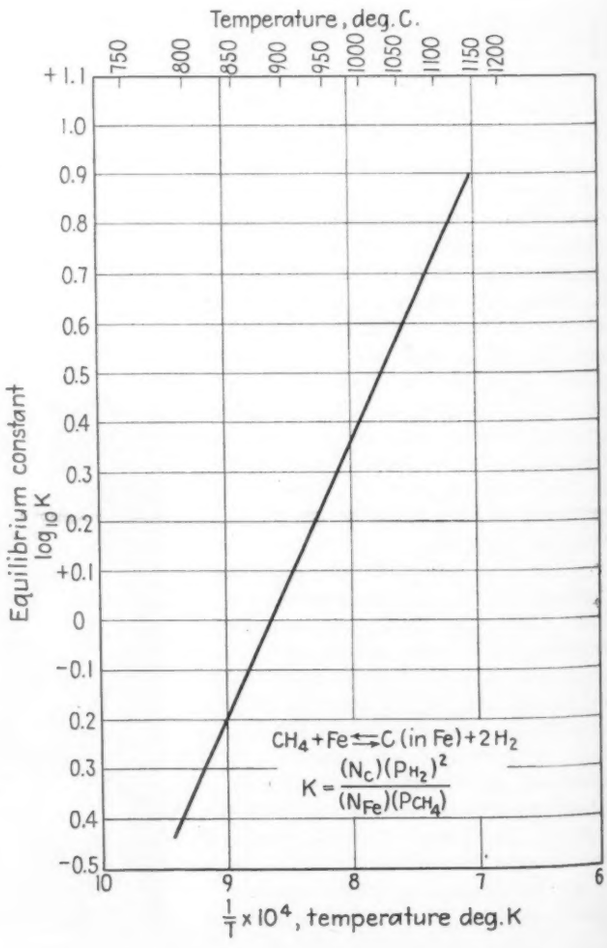

Decarburization—*A Theoretical Analysis*

. . . Continuing last week's discussion of the thermodynamics of gas-metal reactions, the behavior of the variables, temperature, pressure and concentration of the methane-hydrogen mixture, towards iron is outlined. The theoretical aspects of steel decarburization are also presented.

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pressure, of course, affects the equilibrium constant. By algebraic manipulation we can obtain

$$K = P\frac{(N_C)(P_{H_2})(P_{H_2})}{(N_{Fe})(P_{CH_4})(P_{H_2}+P_{CH_4})} \quad (16)$$

Carburization Differences with CO and CH_4

While carburization can be accomplished by the reactions discussed —the monoxide and the methane— there exist distinct differences.

The first difference is in the relative stabilities of the carburizing constituents. Suppose one considers the pure substances. Carbon monoxide is increasingly stable at elevated temperatures, so that less carbon is available for carburization as the temperature increases. This means that a certain concentration of CO, say 99 per cent, is in equilibrium with a steel of less carbon content as the temperature is increased. This is seen below:

TABLE IV

Carburization in CO-CO_2

F. deg.	Percent C in Steel
1740	1.30
1830	0.80
1920	0.55
2012	0.32

The data are taken from Fig. 2.

Methane, on the other hand, is increasingly unstable at elevated temperatures, so that as the temperature is increased, more carbon is available for carburization. This means that a certain concentration of CH_4, say 1 per cent, is in equilibrium with a steel of greater carbon content as the temperature is increased. This is seen below:

TABLE V

Carburization in CH_4-H_2

F. deg.	Percent C in Steel
1740	0.36
1830	0.57
1920	0.73
2012	1.05

The data are calculated from the equilibrium constant.

The second distinct difference between the two compounds is that with the carbon oxides, oxygen is introduced into the steel, but with methane this is not the case.

When a material is carburized with mixtures of carbon monoxide and carbon dioxide, a certain amount of oxygen is introduced simultaneously with the carbon,[30,31] but the amount of oxygen absorbed usually is very small, less than 0.01 per cent between 1470 and 1830 deg. F.[31]

Bain[32] states that oxygen is introduced in pack carburizing. This oxygen penetration would depend upon the steel. In killed steels, the oxygen diffuses with the carbon, but at a slower rate. In rimming steels low in manganese (already saturated with oxygen) no oxygen would penetrate by diffusion. Undoubtedly highly oxidized steels would possibly lose oxygen during carburization, for as the oxidizing constituent in the carburization process is reduced, less oxygen in the metal is in equilibrium with it.

Methane carburization introduces no oxygen, and perhaps even removes it, especially with hydrogen present.

In carburized steels the relation between oxygen and inclusions and the dependence of grain growth on inclusions often becomes apparent from the distinctly different grain pattern in the case, as compared to the unchanged core. Oxygen adsorption is exceedingly marked in steels having some dissolved aluminum. Oxygen elevates the coarsening temperature of the steel, so that a sharp change in grain size is manifest at the limit of oxygen penetration.

Hydrogen-Cyanide Reaction

Equation (10) was mentioned once in connection with equilibrium reactions:

$$2HCN + Fe \rightleftarrows 2C_{(\text{in iron})} + 2N_{(\text{in iron})} + H_2 \quad (8)$$

So far as the author knows, there has not been a study of this reaction.

Commercially a method has been perfected which is termed dry-cyaniding.[33] In this case ammonia is added to natural gas to introduce carbon and nitrogen. The advantage of such method is that one can case-harden at temperatures as low as 1150 deg. F. because the nitrogen decreases the critical points in steel. Quenching is often unnecessary, as the material is sufficiently hard due to the nitrogen.

Liquid carburizing[34,35] depends upon the oxidation of sodium cyanide to the cyanate according to the equation:

$$2NaCN + O_2 \rightleftarrows 2NaCNO \quad (17)$$

The cyanate then decomposes as shown

$$4NaCNO \rightleftarrows 2NaCN + Na_2CO_3 + CO + 2N \quad (18)$$

The carbon monoxide dissolves in the bath and upon contact with iron is assumed to dissociate to carbon and carbon dioxide; the

atomic nitrogen is absorbed as such.

The chemistry of activated baths containing $BaCl_2$, $BaC0_3$, CaCN, $CaCl_2$, and NaCl is probably different.

There appears to be little certainty as to the actual carburizing mechanism in liquid baths. Furthermore, no extensive study of equilibrium reactions between the fused salts and steels appears to be available.

Decarburization of Steel

Decarburization of steel often is the undesirable consequence of improperly controlled heat treatment. Decarburization usually results in decrease of hardness, but decarburization of austenite steels may bring about martensitic hardening. In some cases, however, the purification of metals by decarburization may be sought. Decarburization can take place in two ways:

(a) A change in the equilibrium between the carburizing gases and the iron, may take place in such a way that the atmosphere will decarburize a given steel.

As has been mentioned before, the carbon monoxide and methane reaction (2) and (7) may be decarburizing as well as carburizing, depending upon the concentrations, temperature and pressure. In this case, the equilibrium constant (K′) is the reciprocal of the constant for the carburizing reactions mentioned before. The constants are now written as

$$K' = \frac{(N_{Fe})}{(Nc)} \frac{(P_{CO})^2}{(P_{CO_2})} \qquad (9)$$

(b) Oxidation occurs with an atmosphere, which is oxidizing to both constituents but in different degrees.

The decarburization is effected by oxidation in the gaseous phase by such substances as oxygen, moisture and carbon dioxide, and in the liquid phases, by any oxidizing fused salt.

Oxygen is a very powerful decarburizer

$$C_{(in\ iron)} + O_2 \rightleftarrows CO_2 + Fe \qquad (19)$$

but is accompanied by film formation or scaling.

Another very important decarburization reaction is that of the carburized iron with moisture.

$$C_{(in\ iron)} + H_2O \rightleftarrows CO + H_2 + Fe \qquad (20)$$

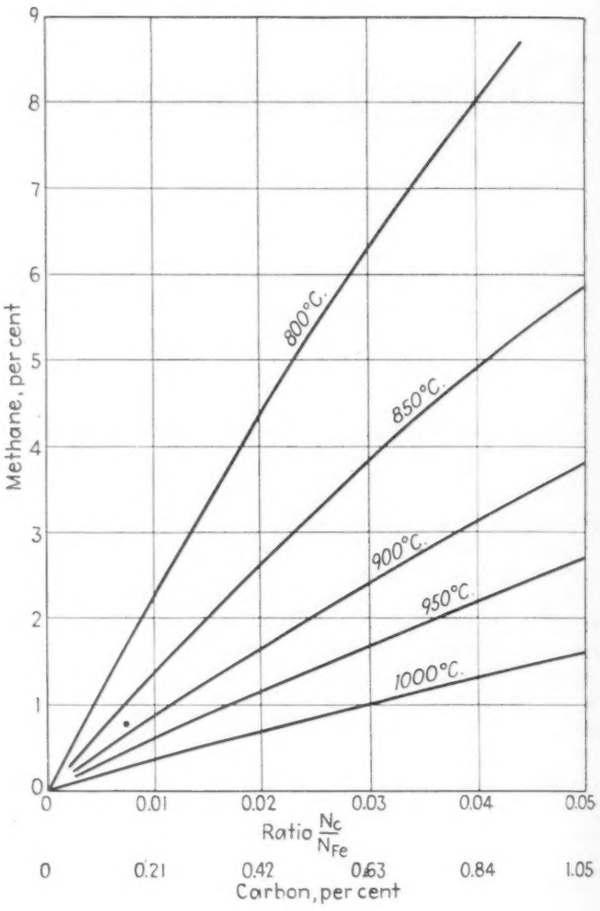


FIG. 6—As the temperature is increased, the carbon content of steel in equilibrium with a given methane content is increased.

Carbon dioxide by itself is a strong oxidizing agent, reacting with steel as follows:

$$C_{(in\ iron)} + CO_2 \rightleftarrows 2CO + Fe \qquad (2)$$

It might be supposed that nitrogen by itself might be a decarburizing agent, behaving according to the reaction

$$2C_{(in\ iron)} + N_2 \rightleftarrows 2CN + Fe \qquad (21)$$

There is no evidence that the molecular nitrogen as such can form cyanogen. It might be possible to decarburize iron with atomic or nascent nitrogen. Data on this are lacking, and the voluminous writings on the subject indicate that where nitrogen was found to be decarburizing, it was due to impurities such as oxygen, moisture or carbon dioxide.

Decarburization with Carbon Dioxide: The reaction of carbon dioxide with carburized iron (Equation 2) has been discussed, but in this case a considerable excess of CO_2 exists to drive the reaction to the right.

At elevated temperatures such as those at which carburizing is carried out, say 1740 deg. F., a high concentration of CO_2, perhaps 15 per cent, will reach an equilibrium with any steel at less than a 0.1 per cent carbon. If a 1 per cent tool steel had been treated, it would have suffered terrific loss in carbon. These relations are obvious from Fig. 2.

The presence of carbon dioxide is often responsible for decarburization. Even if the carbon dioxide is removed before the gas enters the furnace, the carbon monoxide may react in the hot zone to form carbon dioxide.

$$CO + H_2O \rightleftarrows CO_2 + H_2 \qquad (22)$$

To prevent such reactions, the carbon dioxide and moisture must both be removed.

It should be borne in mind also that high concentrations of CO_2 are oxidizing to iron as well as to carbon:

$$\begin{array}{l} Fe + CO_2 \rightleftarrows O_{(in\ iron)} + CO \\ \qquad\qquad \Updownarrow \\ \qquad\quad FeO \rightleftarrows Fe_x{}^{\cdot}O_y \end{array} \qquad (23)$$

Temperature has considerable effect on decarburization, usually increasing it unless there is the entrance of complicating factors. With CO_2, decarburization at 1650 and 2012 deg. F. is rapid, but at

1470 deg. F. the formation of oxide scale interferes with decarburization.

Decarburization in Hydrogen: The question of decarburization by hydrogen has often been argued. Some authorities[37,38] say that pure, dry hydrogen is not decarburizing, while others have held that it is.[26,39-47]

The question undoubtedly has been complicated by the presence of moisture. Pure hydrogen with a dew point of —76 deg. F. is a decarburizer, but a very slow one. The reaction for the austenitic range could be written:

$$C_{(\text{in iron})} + 2H_2 \rightleftarrows CH_4 + Fe \qquad (7)$$

and below the eutectoid temperature:

$$Fe_3C + 2H_2 \rightleftarrows CH_4 + Fe \qquad (24)$$

$$C_{(\text{in } \alpha \text{ iron})} + 2H_2 \rightleftarrows CH_4 + Fe \qquad (7)$$

Pure, dry hydrogen is considered a slow decarburizing agent.[42,48] On the other hand, moist hydrogen — hydrogen saturated with moisture at room temperature, about 3 per cent H_2O (vol.) for instance — is a very good decarburizer.[48,51] In this case the reaction is different, and can be written:

$$C_{(\text{in iron})} + H_2O \rightleftarrows CO + H_2 + Fe \qquad (20)$$

The effect of moisture in hydrogen is seen in Fig. 7. Irregularities in the curve can be explained on the basis of ferrite formation due to slow cooling.[19]

Reaction[20] is favored by temperature, which means that more carbon monoxide is formed with increasing temperature. Hence, a rise in temperature hastens the rate of surface reaction.

Decarburization with Oxygen or Air: Oxygen decarburization occurs according to equation (19), as well as by the following:

$$C_{(\text{in iron})} + 2O_2 \rightleftarrows CO_2 + 2O_{(\text{in iron})} \qquad (25)$$

Air decarburization at 1200, 1310, and 1380 deg. F. is very slow, because the oxide layer helps to form a protection against the gases, but at higher temperatures it is quite rapid.

Nitrogen containing 0.1 to 1.0 per cent oxygen is an excellent decarburizing agent.

Moisture Reaction: The effect of moisture on decarburization has been studied by numerous workers.[42,49,52] Most of the work has been done with moist hydrogen and some with moist nitrogen. In these cases the hydrogen and nitrogen can be considered as dilutants, rather than as reactive gases.

Pure nitrogen itself is inert, but with small amounts of moisture, it is actively decarburizing. As little as 0.05 per cent moisture at 1600 deg. F. produced pronounced decarburization.

Prevention of Decarburization

If commercial heat treatments (hardening, spheroidizing, etc.) are to be carried out successfully, it is vital to prevent decarburization. There are numerous ways of doing this. Probably the most economical is to use controlled atmospheres produced by combustion of city gas or natural gas. In such cases the carburizing nature of the gas is adjusted so as to be neutral to a steel of a given composition, or even to be slightly on the carburizing side.

Neutral atmospheres can readily be employed to prevent decarburization, but they are expensive. Dissociated ammonia, nitrogen, argon, and even hydrogen can be used. All these gases must be dried to be effective. Nitrogen usually contains a few tenths of a per cent of oxygen by volume, and this must be removed; the addition of small amounts of hydrogen to nitrogen to unite with the oxygen to form water, which is adsorbed by alumina, is a good way of removing the oxygen. Dry hydrogen (—48 to —76 deg. F. dew point) is only slightly decarburizing to high carbon steel and can be considered a neutral atmosphere. Argon is expensive and must be oxygen and moisture free.

Vacuum, of course, is a means of preventing decarburization, though the method is impractical for commercial work.

Liquid salts are excellent for small parts, though they are apt to be expensive. Molten borax and boric acid are suggested for high temperature.

Obviously, one remedy would be to use heat treating gas slightly on the carburizing side. However, sometimes this is undesirable. If a metal piece must be carburized in one section without carburization or decarburization in the remainder, the latter can be coated with a protective film of some kind, metallic (copper plating) or ceramic (silicate dopes, sand, etc.). The scaling of some metals, particularly alloys, producing an impervious scale, has been observed. While it is known that nickel will dissolve some carbon, it is difficult to remove it due to the scale formed.

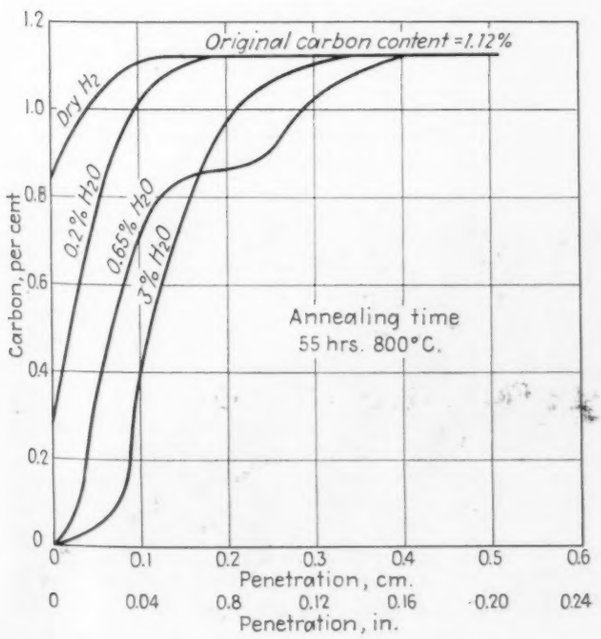


FIG. 7—Effect of moisture in hydrogen on decarburization. Pure, dry hydrogen is a slow decarburizer, but when hydrogen is saturated with 3 per cent water by volume, it is a very good decarburizing agent.

(Ed. note) The subject of decarburization is continued in the discussion of the kinetics of the carburization and decarburization reactions, with which the author concludes this article next week.

Redesigned Fuse Adaptor Saves

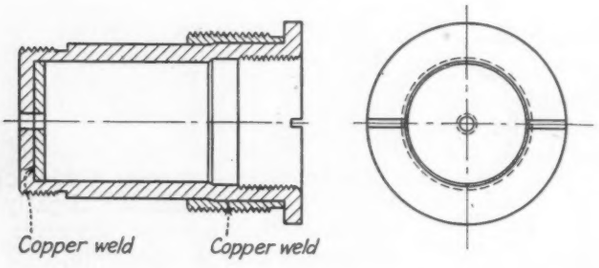
THE present war has reached such colossal proportions that raw materials as well as machine production and manpower have now become vitally critical to the war effort. In redesigning combat equipment to conserve the critical war materials so as to extend their field of usefulness, the Ordnance Department of the U. S. Army, responsible for the design, manufacture, procurement, and maintenance of all the fighting weapons and transport vehicles of the American soldier, has been amazingly successful. This effort alone may be a means to materially shortening the war. It certainly is maintaining volume output of many items, production of which would long since have been slowed down.

One item of ordnance materiel that was introduced by the standardization program and then redesigned to conserve material in mass production is the fuse adaptor. There were so many more sizes and types of shells and bombs than there were fuses, it soon became apparent that the number of sizes of fuses could be cut materially by using reducers or bushings—hence the adaptor, which when screwed to a small fuse will allow its use with a larger shell or bomb than it was originally intended for. One such adaptor weighs 0.97 lb. and originally it was hogged out of a steel bar weighing 3.83 lb., thereby converting at least 2.88 lb. of metal to scrap. This was accomplished on an automatic screw machine with 0.23 hr. labor and this item was also critical to the war effort. To correct this situation a number of commercial stamping concerns were called into consultation by the Ordnance Department.

Out of this consultation, two redesigns were developed that took the form of steel stampings—a single piece in one case and a three-piece job with copper brazing in another. There are many arguments in favor of both methods, but it would appear that the three-piece design is the best provided copper welding furnace capacity is available.

The three-piece job is being done by a midwestern firm formerly making sheet steel automobile pulleys by the roller spinning method. It is still making large numbers of these pulleys for use on army trucks, tanks, jeeps, armored cars, motor generator sets, air compressor units and similar equipment used by the armed services. It also has several other war contracts.

This method requires but 1.81 lb. of raw material losing, only 0.84 lb. to scrap, all in corner trimmings. Only 0.045 machine hour and 0.0035 lb. of copper (for brazing) are required. The gage thickness needed on the main cup was determined by the required wall thickness so that



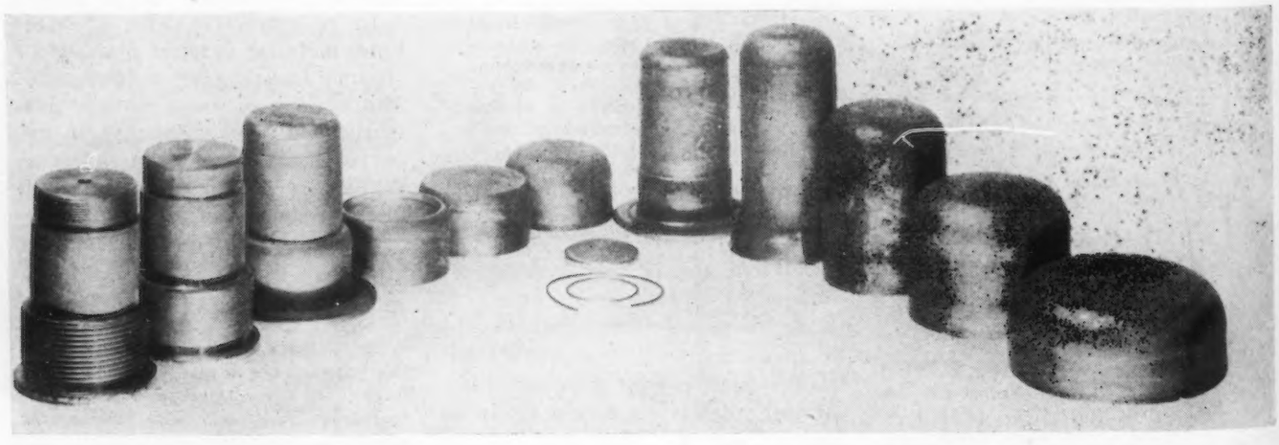
LEFT

FIG. 1—Fuse adaptor made from stampings in three pieces.

o o o

BELOW

FIG. 2—Various stages of the manufacture of the fuse adaptor from drawn sheet metal. At the right are shown the five stages in cupping and drawing the main body of the adaptor. To the left of the center are shown the three stages of cupping and drawing of the sleeve. The disk in the center is the slug pierced from the cup from which the sleeve was drawn. It is later brazed into the bottom of the body to obtain required thickness. In front of the slug is the copper wiring used in brazing the three parts together. At the extreme left is the furnace brazed adaptor, the turned adaptor and finally the completed piece.



Time and Metal

By J. B. NEALEY
Ordnance Department, U. S. Army

. . . A part that is ordinarily produced from bar stock in an automatic screw machine is now being formed from drawn steel components that are furnace brazed and then lightly machined to prepare two threaded diameters. This is one of the many examples of material conservation brought about by redesign in the Ordnance Department.

a minimum amount of machining would be required and the wall thickness was built up where necessary by means of a sleeve, also made from a drawn cup and copper brazed to the main stamping. To obtain the increased bottom thickness required, a slug pierced from the cup from which the sleeve was made was also furnace brazed into place. The operations in detail are as follows:

Operation	Equipment
Blank body & draw	75-ton press
1st reduction	75-ton press
1st anneal at 1750 deg. F.	Conveyor electric furnace
2nd reduction	60-ton press
3rd reduction	60-ton press
2nd anneal at 1250 deg. F.	Conveyor electric furnace
Final flange	250-ton press
Sleeve	
Blank & draw	75-ton press
Form	60-ton press
Pierce slug	25-ton press
Pierce assembly	25-ton press
Assemble	35-ton press
Copper braze at 2050 deg.	Conveyor electric furnace
Restrike	200-ton press
Trim	350-ton press
Turn threaded diameters, face bottom and back face flanges	Sundstrand automatic Stub lathe
Tap open end and thread two diameters	Turret lathe
Drill hole in bottom	Drill press
Mill two slots	Hand miller

The restrike following brazing is for sizing all diameters to finished dimensions, both inside and out. The only machining required includes facing the bottom to remove surplus thickness and attain a sharper outside corner than is practical in a press operation. It also includes facing the underside of the flange shoulder to obtain a good seating surface and maintain the flange thickness. The two thread major diameters are obtained in the same operation, which is done on a Sundstrand or similar automatic lathe. The only machining then left to do is tapping and external threading which is accomplished with collapsible taps and self-opening die heads on a turret lathe; drilling a hole in the bottom and milling screw driver slots. The machining just outlined requires 0.01 hr., while threading, tapping, drilling and milling adds 0.035 hr., or a total of 0.045 hr.

Copper brazing and annealing are accomplished in the same furnace. For brazing a specially prepared atmosphere is supplied which eliminates the use of expensive hydrogen that is commonly associated with

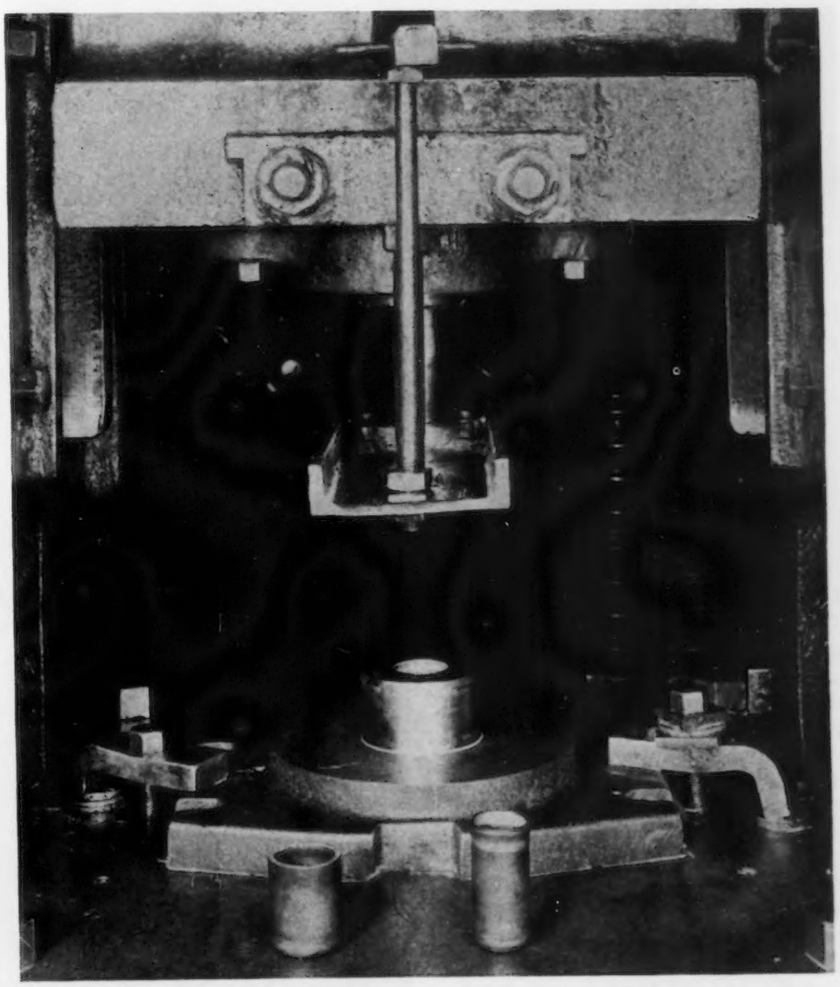


FIG. 3—Second redraw of the adaptor body. This is done in a single action press using a so-called ironing die without hold-down ring. The channel section shown around the punch acts as a stripper inasmuch as the body is not pushed completely through the lower die.

ABOVE

FIG. 4—Flanging operation on the fuse adaptor body. The flange is formed against the cushioned hold-down ring shown surrounding the die.

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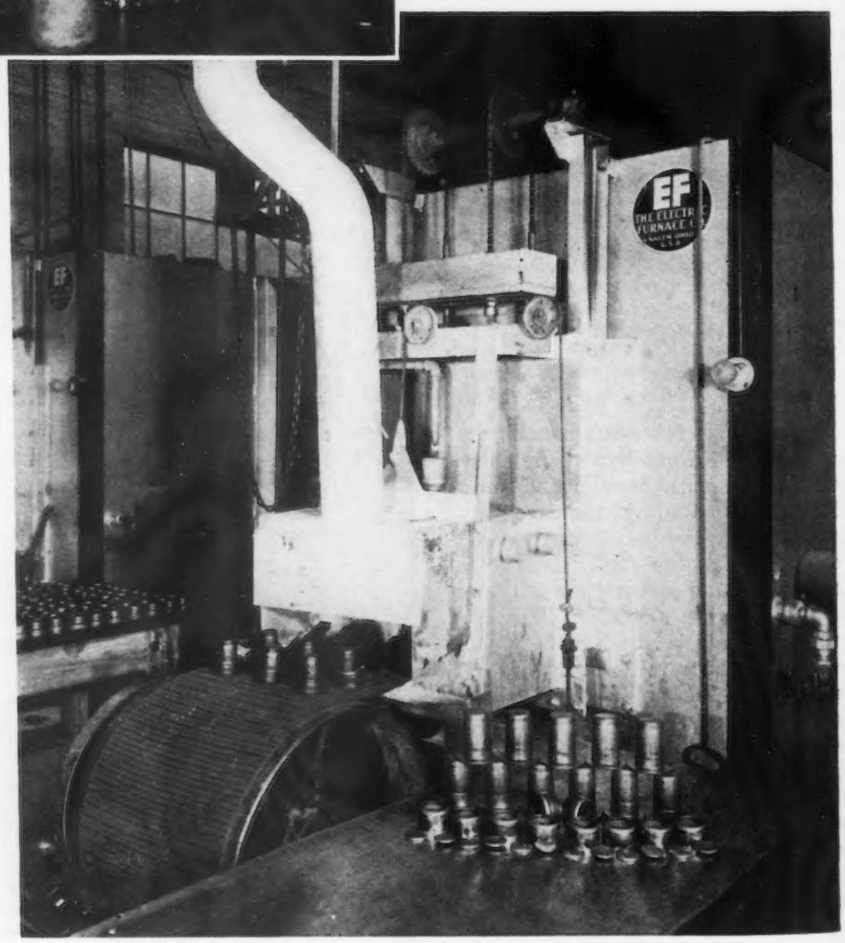
RIGHT

FIG. 5—Assembled fuse adaptors shown entering the controlled atmosphere type brazing furnace. The components of the adaptor are shown on the bench in front of the chain link conveyor.



electric furnace brazing, sometimes known as hydrogen brazing.

The furnace is a special continuous wire mesh belt conveyor type designed for copper and brass brazing at temperatures up to 2050 deg. F. This furnace is about 39 ft. long and is divided into a heating chamber and cooling chamber with a door between the two. A double door vestibule at both the loading and unloading ends help preserve a reducing atmosphere that is forced into both chambers. The heating chamber is 8½ ft. long and 2½ ft. wide, while the wire mesh belt has a width of 18 in. The heating chamber is constructed of 4½ in. of semi-refractories insulated with 10½ in. of insulating brick and is encased in a structural steel shell welded gas tight. Heat is supplied by electric elements consisting of heavy cast nickel and chromium alloy grids mounted on the side wall and in the roof. The heating elements are divided into two circuits, which comprise one automatically controlled zone, liberating a maximum of approximately 90 kw.

A reducing atmosphere is supplied from a combustion type generator and consists of the results of a partial combustion of a mixture of natural gas and air. The cooling chamber is 20 ft. long and consists of an inner and outer shell of ⅛ in. steel plate of welded construction. Cooling water is circulated in the space between these two shells. At both the charging and discharging ends of the furnace is a counterweighted, manually operated door of the cast iron frame type enclosed with a gas tight structural steel frame. Beyond these extend the vestibules with light cast iron plate doors.

The upper flight of the conveyor is supported in the heating chamber on nickel-chromium alloy skid plates and in the cooling chamber

on the bottom of the inner jacket. It is supported on rollers in the charging extension and on steel hearth plates in the discharging section. The lower flight of the conveyor is supported underneath the furnace shell by rollers at suitable intervals. The belt is supported at each end by a pulley about 2 ft. in diameter. One pulley is driven through a worm reduction unit. The capacity of this furnace is approximately 550 gross lb. of steel conveyor and work per hour when operating at a temperature of 2040 deg. F. An automatic temperature control is part of the equipment.

Alternate Method

Where copper brazing facilities are not available, adaptors are being pressed from a single piece of steel and are then machined all over. In this case strip steel weighing 2.5 lb. is the raw material and 1.53 lb. of steel is scrapped. The rough stamping weighs 1.25 lb. and 0.28 lb. of this must be machined off so the machining time is almost that required in the bar stock method.

The relative advantage of the three-piece design is that it results in saving 2.02 lb. of steel, whereas the one-piece design saves only 1.33 lb. of steel as compared to machining from bar stock. The three-piece design requires a few more press operations than the one-piece design, but these operations are light and consequently lighter presses can be employed. Therefore, the amount of press time required for the two methods is about equal. This results in a further advantage in favor of the three-piece design due to the greater availability of the lighter tonnage presses.

The three-piece design requires two anneals and one copper brazing operation, whereas the one-piece design requires two anneals only. The amount of current or fuel required for heating these parts should be about equal, due to the greater weight of the one-piece stamping. The three-piece design would seem to have a disadvantage due to the fact that copper is necessary, but as the actual amount of copper used is only 0.0035 lb. per piece, this is not thought to be of much consequence. There is a further great advantage in favor of the three-piece design over the one piece in that most of the machining time, other than threading, drilling, and milling, is eliminated.

From the standpoint of machining time, the one-piece design should have an advantage over the bar stock method in that slightly less time will be required in machining and the work can be done on other than multiple spindle screw machines which are very critical. The principal limitation of the three-piece design is that there is insufficient electric furnace brazing capacity available to take care of more than a small percentage of the booster adaptors now on contract.

While both methods of making this adaptor reflect very considerable advantages over machining them from bar steel, obviously the three-piece design shows the greatest savings in raw material and time.

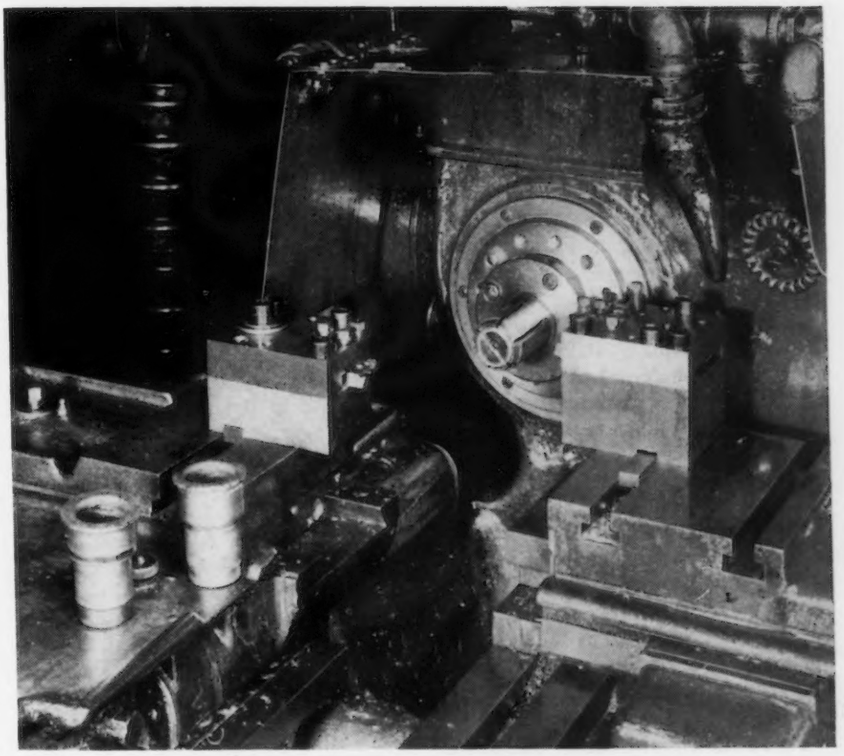


FIG. 6—Turning the o.d. on the two threaded portions of the body and shoulder and facing operations are performed in this Sundstrand automatic lathe setup. The work is chucked with an expanding collet.

Effect of Titanium on Creep Strength

ACCORDING to work on the effect of titanium on the creep strength of steel by P. Bardenheuer and W. Fischer described in *Archiv für das Eisenhüttenwesen*, the addition of Ti to 0.05 to 0.2 per cent C steels, after water quenching at 1200 deg. and reheating to 600 deg., gives a maximum creep strength at 500 deg. at a ratio of Ti:C of 6:9 for all C values. The value of the ratio is dependent on the carbon content, best results being got at C contents of more than 0.08 per cent. The addition of Cr to Ti steels widens the range of the Ti:C ratio in which the creep strength is a maximum. Pure Si steels have a relatively high fatigue strength—of about 18 kg. per sq. mm.—only when the C content is made as low as possible. Linking the carbon to an element forming stable carbides, *e.g.*, Ti, enables Si steels to be obtained with high creep strengths (over 40 kg. per sq. mm.). Additions of Mo, V and W raise the creep strength of Ti steels, the optimum values obtainable being in all cases higher than those accruing from the addition of these elements individually. A large part of the niobium in Nb steels can be replaced by Ti without affecting the creep strength.

Silica and Semi-Silica

ACCORDING to Sosman, silica bricks were first made in Wales in 1822. The raw material was the so-called Dinos rock which has given a name to the brick that is still frequently used on the European Continent. Subsequently it was found that the variety of quartzites such as those mentioned last week were suitable for brick manufacture and that a lime bond greatly facilitated the procedure. This was known as early as 1875, when J. Park-Alexander took out a patent for an addition of 1 to 20 per cent of lime to quartzite. It was considerably later that Fenner (1913) was able to produce a coherent picture of the changes which occurred during the firing of silica brick.

There is considerable variation in the precise technique employed in different parts of the world, but there is an essential similarity throughout. The quartzite is broken down in some type of crusher to a grading varying from ¼ or ⅛ in. downward. The grinding may be dry with subsequent sieving and remixing, or may be carried out in a wet pan, approximately 2 per cent of lime being milled in with the material. For a long while it was not found possible to dry press silica brick due to lamination occurring with the normal grading and other gradings giving porous brick, but this method, which is much faster, is now quite generally employed.

The opposition to dry-pressing was formerly so strong that special machines were devised that enabled "clots" of silica batch to be dropped from a height into a mold, to simulate the bond forming process and yet permit increased production rates.

The drying of silica brick is quite straightforward but great care is needed in firing. The finishing temperature is generally about 3605 deg. F. which is sufficiently high to get rapid conversion without the risk of the whole brick going to cristobalite. Periodic kilns are generally used, though both in Germany and in the United States considerable use is also made of tunnel kilns. A clearer picture of present day methods of manufacturing can perhaps be gained by following through the procedure adopted in the manufacture of a particular roof, namely that used in the cooperative investigation referred to earlier in this section.

In this British works the Welsh quartzite is first jaw-crushed and then dry milled, mechanically sieved, and fed to a mixer. Slaked lime, together with sulphite lye, are added in the form of a slurry, the amount of lime being sufficient to yield about 1.5 to 2.0 per cent in the fired brick. After some 20 min. mixing, the material is ejected and passed to the molding tables. A typical grading of the material was found to be as follows:

	Per Cent	
On 7 mesh	19	
7 to 25 mesh	40.5	
		59.5
25 to 72 mesh	19.5	
72 to 150 mesh	9.5	
Through 150 mesh	11.5	
		21.0

It will be seen that the general grading is of the 60:20:20 type which is rather lower in "fines" than the usual silica brick batch. The moisture content which amounts to about 7 per cent is checked periodically by means of a calcium carbide rapid moisture tester. Roof blocks (12 x 6 x 3.34 in.) are made in loose lined molds using pneumatic rammers. The brick are tunnel dried to a moisture content of 0.2 per cent and are then set in a down draft beehive kiln and fired to about 2640 deg. F. Table II shows the properties of the unfired silica brick. It will be seen that the grading is essentially that of the original batch, indicating that comparatively little breakdown of the grains has occurred during molding. The bulk density (about 2.05 gms/c.c.) is considerably higher than that of the fired brick. The low specific gravity (2.618) of the unfired brick is due to the incorporation in the batch of a proportion of silica brick "wasters." The permeability to air is only about 1/20 of that of the fired brick.

Effect of Grading

Hugill and Rees have done an extensive research on the effect of grading on the porosity of silica brick. Their discovery that a 45:10:45 type grading gave a high bulk density in the fired product has been the starting point of a

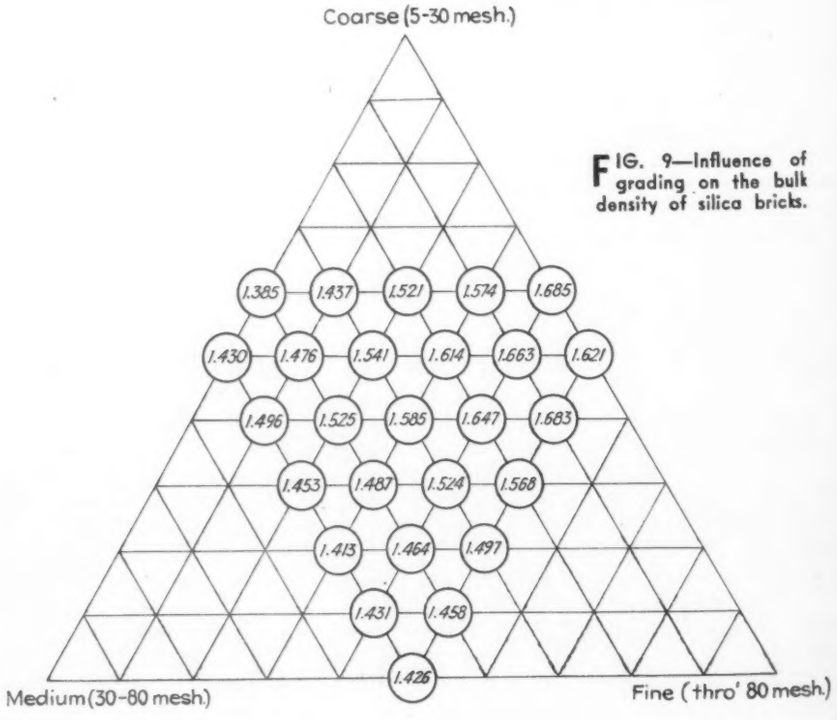


FIG. 9—Influence of grading on the bulk density of silica bricks.

Refractories

By J. H. CHESTERS
Central Research Department, United Steel Companies, Ltd., Stocksbridge, England

o o o

. . . Discussion of the manufacture and properties of silica brick and comments on semi-silica and silicosis conclude the author's study of silica and semi-silica refractories. Last week he presented data on temperature behavior of silica brick, its reactions with oxides, and its raw materials.

great deal of other refractory research and improvement, for example, graded induction furnace linings. The results of their work are summarized in Fig. 9.

The same authors have carried out work on the effect of repeated firing on the properties of silica brick. Thus the curve given in Fig. 10 provides a useful guide to the effect of firing on the specific gravity (powder density) of the product. Under the particular conditions used, the specific gravity had fallen to about 2.41 after one firing, 2.38 after two firings, and then fell off very gradually to a limiting value of 2.31 after 11 firings. Most of the well-fired products now available fall within our own tentative specification, that all brick should be less than 2.38 specific gravity, and the average for the consignment less than 2.36. If the specific gravities of a large number of deliveries are plotted in the manner described in the section on testing (THE IRON AGE, Feb. 6 and 13, 1942) a fair idea of the degree of control existing in the particular brickworks can be obtained. Hugill and Rees have also shown that the porosity, although rising considerably as a result of the first firing, tends to decrease again during subsequent firing though in their particular case, only to 27.0 per cent.

Some of the brick on the market today, for example, those made from Findlings quartzite, have much lower porosities, 18 per cent being a typical figure. These authors have also discussed the change in the proportion of the quartz, cristobalite and tridymite as a result of repeated firing. They made microscopic studies of the brick that had been fired 1 to 11 times and thus determined the amounts of the various constituents. They assumed the glass content to be approximately 10 per cent throughout and found that after one firing some 30 per cent of raw quartz remained (see Fig. 11). The cristobalite content was about 45 per cent, the remaining 15 per cent being tridymite. After eleven firings the tridymite increased to about 75 per cent, the cristobalite fell off to about 5 per cent, while about 10 per cent of raw quartz still remained. Examination of more recent deliveries suggests that the firing treatment received today is considerably more severe, the amount of raw quartz left even after one firing often being quite negligible.

Mineralizers

A great volume of research has also been carried out on the influence of mineralizers such as iron oxide and alkalies on the rate of conversion and in particular on the percentage of tridymite formed. As Sosman points out, the ideal bond for a silica brick would be one that would speed up the conversion to a desired degree and then volatilize at the top temperature so as not to lead to any reduction in refractoriness. Bricks have been made without any added bond and some of the results obtained in service suggest that this is a definite advantage. The bricks are weaker, but if properly made, need not be crumbly. The reason why no marked improvement is obtained is doubtless due to the changes which occur during the first few days in service in the furnace. Iron oxide and lime are absorbed from the furnace atmosphere and the brick matures. Some of the surface fluxes migrate into the interior and the resulting network of cristobalite crystals with interstitial glass bears little relation to that of the original brick. It is probable that the composition of the working face of a brick made without added bond would soon be similar to that of an adjacent brick made with added bond, and hence, provided no damage was done to the roof in the maturing period, the final result would probably be very similar.

The main use of mineralizers is that they enable the manufacturer of silica bricks to obtain a product of the desired mineral constitution without using the prolonged firing treatment that would otherwise be necessary. The importance of the glass formed by the lime with the silica and impurities in the quartzite in aiding tridymite development has been lucidly described by A. J. Dale. Lime speeds up the conversion of quartz to cristobalite, while iron oxide greatly accelerates the production of tridymite. This can be clearly seen by examining an iron spot in a silica brick, where it will be found that the percentage of tridymite present is far higher than in the surrounding material. For some purposes, such as Tropenas converters, brick with as much as 5 per cent iron oxide is preferred because of its higher thermal shock resistance. Other mineralizers such as phosphates and alkalies have been used from time to time but have mostly been replaced in the end by mill scale. Salmang has shown that brick consisting almost entirely of tridymite can be produced by the use of special fluxes high in alkali, but since this results in an appreciable drop in refractoriness, their use is likely to be limited to coke ovens and other applications where the temperature is lower than in the open hearth furnace. Mention should also be made of clay bonded silica brick which, although only used for certain special purposes, as arc furnace roofs, have quite good properties. The presence of the clay is bound to result in a slight drop in refractoriness, but for some purposes this is more than offset by the improved spalling resistance.

From time to time objection is made to silica brick, on the ground that they have a mottled appearance—usually brown spots on a pale yellow brick. A good deal of work has been done on the cause of this phenomenon, which is said to be associated with condensation of sulphurous vapor in the early stages of firing. The general con-

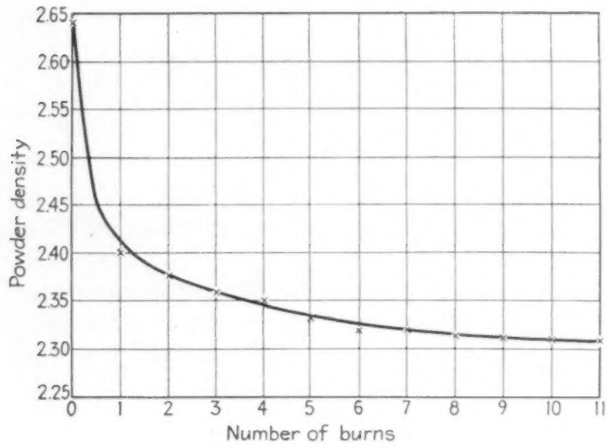


FIG. 10—Influence of repeated firing on the powder density of silica bricks.

clusion is that mottling does not indicate a poor brick.

Properties

The normally discussed properties of silica brick will not be dealt with here as they have already been mentioned in the section on the basic open hearth furnace roof (THE IRON AGE, May 22 and 29, 1941). Certain other properties, however, must be considered.

Typical thermal expansion curves for silica brick of varying degrees of conversion are shown in Fig. 12, while the corresponding expansions over the temperature range 68 to 1832 deg. F. are given in Table III and the curves are all markedly different from the smooth and almost linear expansion shown by a fireclay or magnesite brick, and it is not surprising that brick having such peculiar characteristics should be unusually susceptible to thermal shock. Thus brick A which is a typical hard fired silica brick, has a total expansion at 1832 deg. of 1.1 per cent, of which about one-half occurs below 572 deg. With brick B this low temperature change, which is mostly due to the alpha-beta cristobalite inversion, is even more marked. Bricks C and D are definitely of the soft fired type, brick D being mostly raw quartz. Both C and D show an appreciable quartz change in the region around 1065 deg. F. It is of interest that brick D finds considerable application in acid bessemer converters where the rate of heating up would be too great for a hard fired brick, such as A, to withstand. It would, however, be quite useless for open hearth purposes, due to the very considerable after-expansion which occurs when the firing temperature (about 2460 deg. F.) is exceeded. Thus in a laboratory test in which it was heated to 2550 deg. F. it proceeded to grow and after only two hours had expanded permanently by more than 2 per cent. Really hard fired silica brick such as brick A shows no such permanent expansion on re-firing and have even been known to show a slight firing shrinkage. It is of interest to note that the precise temperature at which the alpha to beta cristobalite change takes place varies considerably with the particular brick and that except in used brick, where the cristobalite crystals are unusually large, it occurs over quite a wide range of temperature.

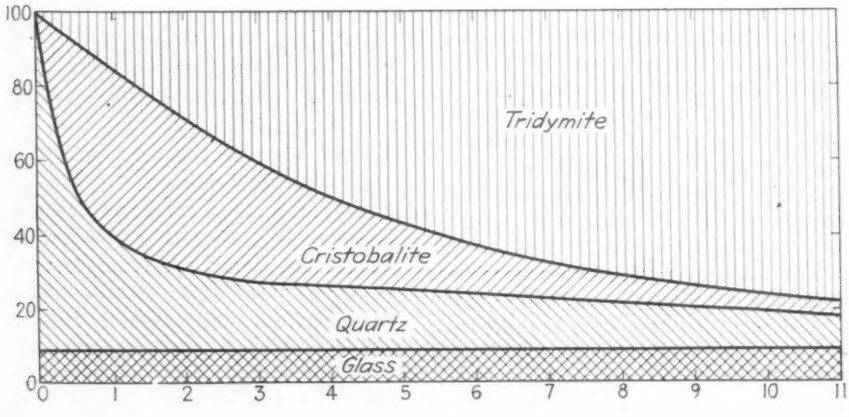
The conductivity of silica brick is about 6 B.T.U. at room temperature, and rises considerably with increasing temperature, being about 10 B.T.U. at 1830 deg. F. (mean). This is of the same order, but slightly greater than that of fireclay brick, but considerably less than that of most basic refractories.

The resistance of silica brick to attack by various oxide slags has been very ably discussed by Birch in his article on equilibrium data, and will not be dealt wtih at any length in this section. As already stated, silica brick show a great tolerance both for iron oxide and for lime, but are readily attacked by alumina and by the alkalies. The amount of liquid formed when various concentrations of impurities are present may be calculated from the known phase rule equilibria, and the correlation of the results so obtained with experience both in the laboratory and in the works is quite good.

A series of experiments by Dodd has shown that certain silica brick when heated in water vapor at only 2912 deg. F. show marked crumbling and even fusion. The cause of this breakdown is not clear, but the work at least supports the generally held opinion that strongly reducing conditions such as may result from the use of fuel high in hydrogen (such as coke oven gas) may lead to premature failure of open hearth furnace roofs.

The applications of silica brick in the steel plant have been dealt with already in the sections dealing with the basic and acid open hearth, the electric furnaces, and the acid bessemer. Silica brick are also used to a certain extent in reheating furnaces and are the principal refractory for the construction of coke ovens. The brick used for this latter purpose do not come within the purview of the present series of articles, but are essentially similar to steelworks silica brick except that in general they are finer ground and are made in the form of rather complex shapes.

FIG. 11—Influence of repeated firing on the proportions of tridymite, cristobalite and quartzite in silica bricks.



Semi-Silica

In addition to straight silica brick, considerable use is made in the steelplant of sand-clay brick containing about 88 per cent silica. Such brick, which are known as semi-silica or sand brick, may be made from the naturally occurring sand-clay mixture or from batches prepared artificially. Their prop-

erties, which are intermediate between those of silica brick and fireclay brick, have already been discussed in connection with basic open hearth furnace checkers (THE IRON AGE, Aug. 7, 14, and 21, 1941). Apart from cheapness, they have the advantage of being essentially volume constant in use, of having a considerably higher thermal shock resistance than silica brick, and of tending to glaze very readily. They also have another property which still requires explanation, that of resisting penetration by molten slags. Thus if a silica brick and a semi-silica brick are situated side by side in a checker, it may be found that although the semi-silica may be more badly worn, the attack is largely limited to the surface, whereas with the silica brick the fluxes have penetrated throughout.

Silicosis

The use of silica, particularly in its ground condition, is attendant by one very serious risk, that of silicosis. At one time it was thought that the sharp particles formed, as for example when tools were ground on sand-stone wheels, entered the operator's lungs and damaged them by laceration. Research has shown, however, that surprising as it may seem, the reaction is a chemical one, the silica actually becoming an integral part of the lung and gradually rendering it inoperative. The precise cause of silicosis is still far from clear, but it can be taken as definite that frequent exposure to silica dust, whether produced by grinding brick or from crushing raw quartzite, is highly dangerous. Considerable protection can be obtained by the use of suitable respirators but wherever possible the risk should be eliminated by changing the procedure to avoid dry grinding or mixing. With acid induction furnace linings, an addition of only 1 per cent of moisture is sufficient to keep down the dust without adversely affecting the performance of the lining.

Acknowledgment

In conclusion the author wishes to express thanks to Dr. T. Swinden, director of research, United Steel Companies Ltd., for permission to publish this article, Sir Lawrence Bragg for permission to use Figs. 1, 2, and 3, the British Ceramic Society for permission to republish Figs. 9, 10, and 11, and his friends in the steel and refractories industries for their constant cooperation.

TABLE II
Properties of Unfired Silica Bricks

Grading B. S. Sieves	Tyler Equivalents	Batch A	Batch B	Batch C
		Percent		
On 7 mesh	On 8 mesh	18	20	17
7- 25 mesh	8- 28 mesh	36 } 54	36 } 56	31 } 48
25- 72 mesh	28- 65 mesh	20	17	22
72-150 mesh	65-150 mesh	12	13	15
Through 150	Through 150	14 } 26	14 } 27	15 } 30
Bulk Density (Mercury Displacement) g.p.cc.		2.08	2.05	2.05
Specific Gravity (Rees-Hugill Flask)		2.618	....	....
Permeability to Air (Perpendicular 6 x 2⅞ in. face)				
(a) Through one skin		0.0047	....	....
(b) No skin		0.0078	....	....

TABLE III
Linear Expansion of Silica Bricks of Varying Degrees of Conversion (68 to 1832 deg. F.)

Code Letter:	A	B	C	D
Specific Gravity:	2.32	2.35	2.42	2.52
Thermal Expansion, per cent				
Temperature, Deg. F.				
68	0.00	0.00	0.00	0.00
122	0.03	0.03	0.04	0.02
212	0.09	0.07	0.11	0.05
302	0.23	0.16	0.24	0.10
392	0.50	0.36	0.43	0.21
482	0.67	0.73	0.65	0.36
572	0.78	0.89	0.80	0.43
662	0.85	0.96	0.87	0.49
752	0.91	1.00	0.93	0.53
842	0.96	1.05	0.97	0.57
932	1.00	1.10	1.01	0.63
1022	1.03	1.15	1.04	0.74
1112	1.04	1.25	1.12	0.86
1202	1.05	1.29	1.16	0.88
1292	1.06	1.31	1.17	0.90
1382	1.08	1.32	1.20	0.92
1472	1.10	1.32	1.21	0.93
1562	1.11	1.32	1.22	0.94
1652	1.12	1.33	1.22	0.94
1742	1.12	1.33	1.22	0.95
1832	1.12	1.33	1.22	0.95

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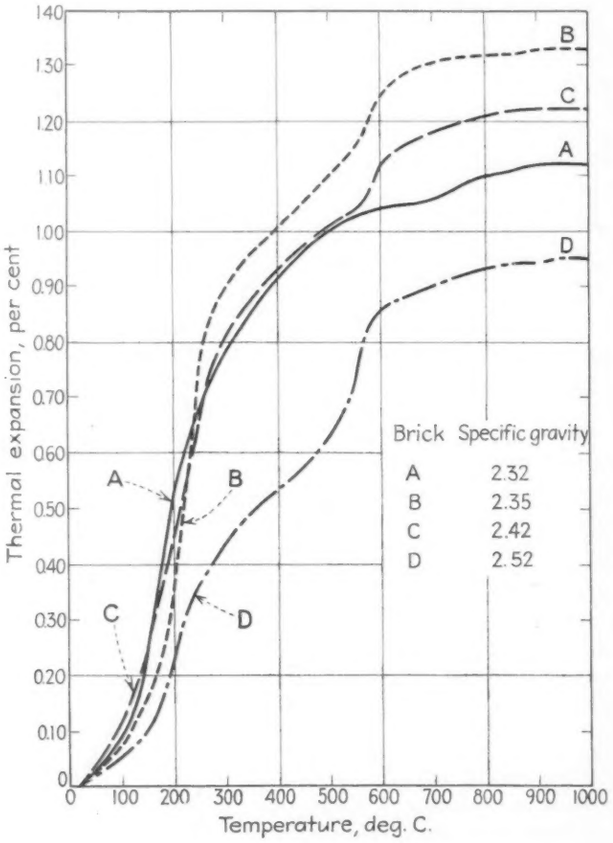

FIG. 12 — Thermal expansion curves for bricks of varying degrees of conversion.

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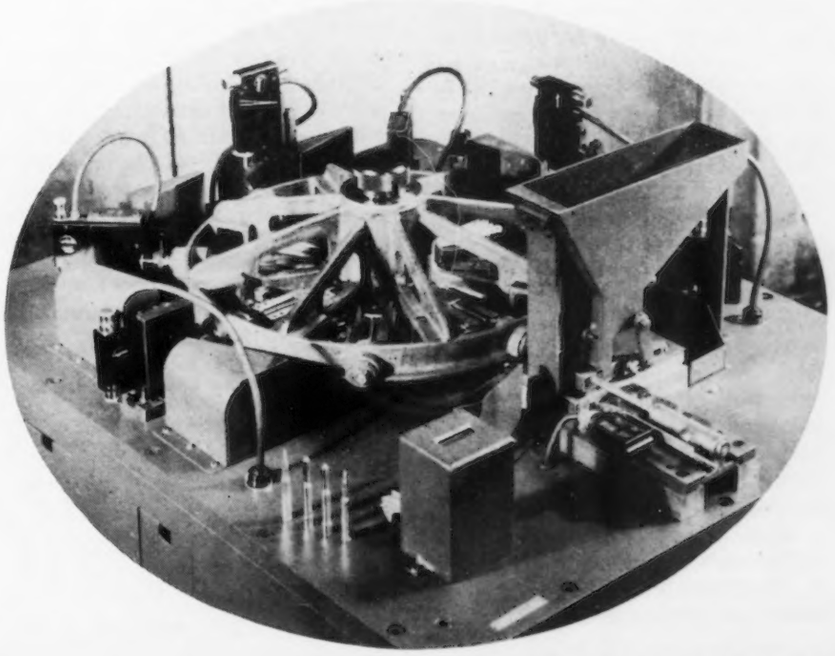
Machine Gages Small Cartridges Automatically

A NEW fully automatic machine known as the Chekmatic has been developed and perfected by the Sheffield Corp., Dayton, Ohio, and is now being applied to the checking of 0.30 and 0.50 caliber loaded cartridges. The Chekmatic automatically inspects the cartridge for chamber depth, diameter of ejector groove, depth of primer, head diameter, overall length and head thickness. It also weighs the cartridge, rejects any having one or more inaccurate dimensions and electrically counts those which are passed as good at the rate of one cartridge per second. Tolerances range from 0.004 to 0.008 on all dimensions except overall length which has a tolerance of ±0.020.

Loaded and finished cartridges are manually placed in a hopper on top of the machine. They fall by gravity into the feeding mechanism which injects them into chambers on the index wheel. Sheffield No. 1 Electrigage heads are arranged in proper sequence around an index wheel into which are built eight cartridge chambers of the same dimensions as the chambers of weapons from which the cartridges are to be fired. The plunger which loads the cartridges into the index wheel chambers operates at a 25-lb. pressure. Any oversize or deformed cartridge which will not enter the chamber under this pressure actuates a solenoid relay causing the plunger to kick out of position and instantly stops the machine so the cartridge can be manually extracted from the feeding mechanism.

As the wheel indexes around, it carries the cartridges through the six gaging stations. If the dimension being checked is undersize or oversize at any station, the cartridge is automatically ejected from the chamber into a container which collects rejected cartridges from that station. Those cartridges which successfully pass all gaging stations are automatically ejected from the chamber into a chute where each is mechanically fed onto a counterbalanced scale extending from the circumference of a wheel mounted on the same shaft as the index wheel. Each weighing device is calibrated for a constant, desired tolerance. If the cartridge is too light, it is automatically dumped into a rejection container. If it is of the correct weight or heavier, it remains on the scale until it passes an electric counting device, after which it falls into the container for good or passed cartridges.

SIX gage heads, mounted around an index wheel, check loaded shells for chamber depth, diameter of ejector groove, depth of primer, head diameter, overall length and head thickness. Minimum and maximum master gages permit adjustment of each gage head to the tolerance limits.



MARTEMPERING . . .

. . . A description of an old-new method of quenching, which the author designates as Martempering. This technique can definitely be utilized to extend the usefulness of the new NE alloys and also the older types of alloys. A description of the Jominy end-quench test mentioned herein will appear in THE IRON AGE, issue of Feb. 11, 1943; and for articles on NE steels, see issues of Aug. 6 and Sept. 17, 1942.

By B. F. SHEPHERD
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MARTEMPERING is a term used to describe a heat treating operation whereby martensite is produced with a minimum of residual hardening strains. It consists of a combination of an intensive quench for a short period, transfer to a liquid bath at elevated temperature, holding for sufficient time to equalize the temperature throughout, followed by cooling in air to atmospheric temperature and conventional tempering or drawing, depending upon the type of steel and sections involved. The initial operation may be eliminated and parts quenched directly in the liquid bath.

Martempering differs from austempering which definitely avoids the production of martensite with the latter type of quench.

Quenching practices have a major influence upon the potentiality of any steel and should be more closely associated with chemical composition when predicting the physical properties. There is a general erroneous impression that the potential physical properties of the final product are almost entirely a function of chemical composition. This is not correct. The chemical composition restricts the range of potential physical properties. The methods of manufacture, grain size, etc. control the limits within this range. Cleanliness determines the uniformity and reproducibility of service life, other factors being equal. The importance of the method of manufacture, grain size, cleanliness, etc. are only occasionally placed in their proper relation to the entire picture. The utilization of variations in conventional quenching methods and development of new quenching methods based on modern metallurgical conceptions are practically never emphasized.

Steels are often changed to a higher alloy or higher hardenability to compensate for inadequate quenching practices failing to develop the maximum physical properties in the center of heavy sections. Extremely drastic quenches will often be used in an attempt to extend the range of physical properties possible with the low hardenability NE alloys. This practice can only result in many service failures with responsibility being placed incorrectly on the steel.

There is an erroneous impression being created by the technical literature that carbon is only responsible for the maximum hardness that can be obtained in any steel and hardenability from the standpoint of depth of hardening is a function solely of alloy content. This is incorrect. Reference to any A.I.S.I. data will show that the Jominy end-quench hardenability curves are flattened out for increasing carbon content for any one series of steels of the same alloy content.

Increases in hardenability for any given alloy content can be obtained by increases in carbon content without danger of producing quench cracking or objectionable residual hardening stresses by use of a quench in salt at elevated temperatures or a timed water-elevated temperature salt quench. Such a procedure would greatly extend the field of usefulness of NE alloys.

The quenching method proposed

Effect of Carbon upon Hardenability—Jominy Test

Cooling rate, deg. F. per sec. / Distance from water quenched end, in.							620 1/16	190 1/8	70 1/4	30 1/2	10.3 1	4.3 2
NE 9400 Series	C	Mn	Si	Cr	Ni	Mo	Rockwell C					
9420	0.18	0.91	0.48	0.42	0.29	0.13	44	39	32	22	16	12
9430	0.335	0.90	0.55	0.33	0.35	0.19	52	51	47	31	24	22
9440	0.41	0.90	0.57	0.31	0.37	0.15	55	55	53	42	32½	30

is not a "tricky" quench. It is an advance that must be made if maximum conservation of alloys is to be obtained, and also an advance that will eventually be made to develop the maximum physical properties which are possible in any particular alloy.

These times are a challenge to ingenuity and metallurgical knowledge. The quenching procedure proposed is based on fundamental metallurgical knowledge, and can be utilized very effectively if its potential possibilities are realized.

It was thought desirable to describe this process with illustrative examples of results obtained with some of the new NE steels together with a review of the fundamental factors affecting the operation.

Desired structures in steel are produced by preventing the Ar transformation (result: austenite, martensite or mixtures of the two), or restricting the range of temperature over which it is permitted to occur (result: pearlite—troosite bainite—intermediate reaction products or mixtures). This control is obtained by proper heating and cooling (quenching cycles).

The same cooling rate after the same austenizing* treatment will produce the same structure and hardness in steel of similar grain size, cleanliness, etc. no matter how that cooling rate was produced or in what section of the part it is located. Similar structures mean hardnesses but the reverse is not true, i.e., similar hardnesses do not necessarily mean similar structures.

Austenizing is an adaptation of "austenitizing," i.e., the temperature-time cycle producing austenite.

Heating Process Simple

The heating process is comparatively simple as it is aimed at the production of one constituent, i.e., a homogeneous austenite. The ACl-3 temperatures, above which heating must be conducted, vary with actual composition but are known or readily determined. Exposure above the ACl-3 point renders the steel capable of dissolving the excess constituent. This may not always be desirable particularly in hypereutectoid steels but the pearlite should be transformed into homogeneous austenite.

The rate at which the pearlite forms homogeneous austenite is a function principally of the chemical composition as many steels are sluggish, have difficultly soluble carbides or a very slow diffusion rate. The soaking time necessary to obtain maximum hardenability varies with many steels. When exposed too long after complete diffusion occurs, an increase in the austenitic grain size may result. Changes in critical cooling velocity and alteration in desired physical properties may then be expected. A higher temperature than necessary has the same effect although this is less dangerous with fine grained steels than too low temperature.

The primary effect of the austenizing temperature is in the character of the austenite produced. Uniform austenite places the steel in proper condition to respond in an orthodox and uniform manner to controlled quenching and production of uniform maximum physical properties. Improper austenizing can not be remedied or corrected by the subsequent quenching method.

After properly austenizing, selection of a desired rate of quenching or cooling will control the final structure.

The different rates of cooling desired are produced by quenching in liquid media—sodium hydroxide, 10 per cent brine, water, various kinds of oil, and for special steels, air, usually under pressure. Control of the quenching operation is seriously affected by a natural law, i.e., mass of the part, the interior portions always cooling slower than the outside and sometimes so slowly that the desired rate required for certain steels cannot be obtained and a change in chemical composition is necessary.

These liquid media are rarely used to maximum efficiency. A wide range in cooling rates can be ob-

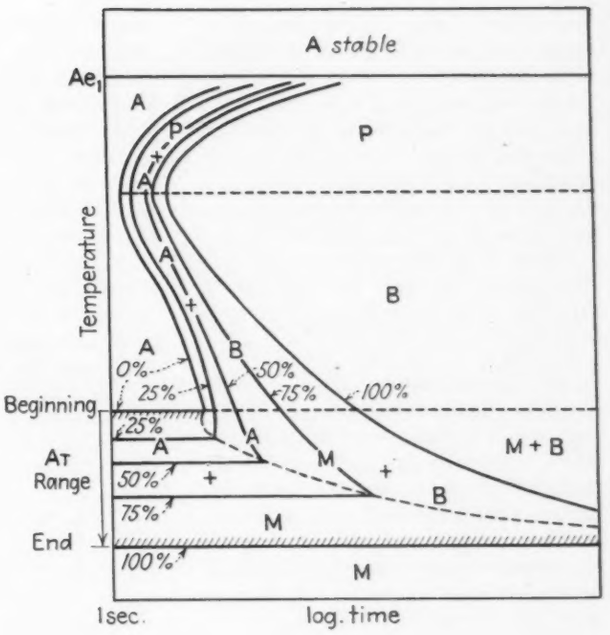


FIG. 1 — Modified S-curve diagram. Full lines represent per cent of austenite transformed. A = austenite; P = pearlite; B= Bainite; M= martensite or tempered martensite.

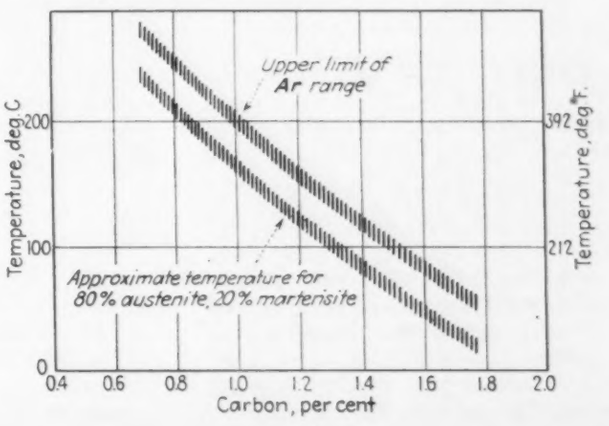


FIG. 2 — Influence of composition on martensite transformation temperature range for plain carbon steel.

tained in each liquid depending upon the temperature of the liquid and whether the part is merely immersed, agitated, quenched in a spray or in a fixture under pressure. Various types of oils vary substantially in quenching speed but the actual type and temperature are rarely mentioned in discussion.

Scott has mentioned* that "quenching a steel cylinder in a vertical position will tend to give a greater percentage of soft area but also a greater variability in results than will quenching the long axis of the cylinder in the horizontal position——."

* *A.S.M., 1940, p. 517.*

The intensity of quench can be measured according to a method developed by Grossman wherein it has been defined as H value. It is difficult to use this method to determine the H value of quenches conducted in special sprays and fixtures. Sprays cannot be applied to many commercial shapes on account of excessive distortion due to unsymmetrical shapes.

A quenching medium and method of application, i.e. spray, etc. must be selected to produce a cooling rate slightly faster than the critical cooling rate of the locations to be hardened. Excessively high cooling rates cause hardening cracks, residual hardening strains high enough to seriously affect service life, distortion, etc. Many steels are identified as water, oil or air hardening so as to readily indicate the slowest cooling medium which will produce full hardening. As a general rule the slower the recommended quenching medium the deeper the steel will harden. As the severity of quench is increased to obtain the required hardness, the distortion will usually be progressively increased.

Hardening cracks readily indicate too severe a quench but excessive residual hardening strains are often present even though the part does not crack. These are not noticed or relieved by tempering and cause many service failures even in parts of relatively simple shape. They are the result of two factors. First, the change (increase) in volume which occurs with the formation of martensite and second, the difference in rate of contraction which normally occurs as the temperature is lowered.

The differences in rate of contraction are due to differences in mass, i.e. cooling rates, and become greater as the speed of cooling is increased. They are usually greater in complicated sections as these require an intensified quench (sprays, etc.) in order to obtain uniform hardening.

These stresses, called heat stresses to identify them as being produced by contraction due to drop in temperature, are also intensified by the change in volume occurring when martensite forms. This constituent is very hard, and nonductile, it has no capacity for adjustment and cannot relieve stress by yielding locally and thereby shifting the load over a larger area, lowering the unit stress and unit strain*. Wherever austenite is retained in a martensitic matrix this very ductile constituent relieves internal stress to some extent by yielding locally.

Ed. Note:— Next week the author concludes with data on cooling rates, transverse hardness surveys on NE steel samples, and a detailed description of the salt bath furnace used for quenching.

* *The terms stress and strain are often used interchangeably as both are inseparable, stress being the force producing strain and strain the deformation produced by stress.*

Martensite does not normally form isothermally or at one definite point as the temperature drops. It forms over a range of temperature, as has been excellently illustrated by Morris Cohen* in the modified S curve shown herein as Fig. 1.

* *A.S.M., 1940, p. 565.*

This diagram, to quote Cohen, "also shows what happens when austenite is cooled to some temperature within the Ar range and is then held at this constant temperature——."

The austenite finally after the time period indicated "decomposes isothermally (into bainite, it is assumed) until the austenite completely disappears."

The Ms point or that at which the initial grain of martensite starts to form varies with different steels and within a narrow range for any one steel depending upon its prehardening thermal history, grain size, etc.

Greninger and Troiano have shown the influence of composition on martensite transformation in plain carbon steels, as indicated in Fig. 2 herein.

Fire Precautions When Machining Magnesium

PRECAUTIONS which should be observed in order to prevent fires when machining magnesium alloys, as recommended by the American Magnesium Corp., are: Do not allow chips or grindings to accumulate on machine, floor, clothing or person; back tool away from revolving work when not cutting; avoid smoking, generation of sparks or open flames near machining or grinding operations. Easily removable leather or asbestos aprons should be worn by the operator.

Should magnesium chips ignite, the fire should be extinguished with one of the following materials, preferably one of the first three listed:

(1) No-inferno; Z. S. Chapman Co., 765 West 98th Street, Los Angeles.

(2) Pyrene G-1 powder; Pyrene Mfg. Co., Newark, N. J.

(3) Chokeout No. 1; O. Hommel Co., 209 Fourth Ave., Pittsburgh.

(4) Powdered bituminous coal, screened to pass 10 mesh and remain on 28 mesh to which 10 to 20 per cent fine graphite has been admixed.

(5) Dry cast iron turnings.

(6) Dry sand.

The extinguishing agent should be placed near the machine in enclosed containers ready for immediate use. Do not use water or any conventional liquid or foam type extinguisher. Localize the fire and scrap it away from adjacent turnings. Avoid contact of burning magnesium with concrete floor.

New Equipment . . .

Plant Service and Safety Apparatus

New developments in lubricating devices, inter-communicating systems, lockers, and personnel safety equipment are described in this review of correlated products.

Oil Window Unit

THE Bijur oil window unit, manufactured by *Bijur Lubricating Corp.*, Long Island City, N. Y., is a new pre-assembly, especially devised for the convenient indicating of oil level when the unit

is installed in a "built-in" oil-reservoir casting. The unit consists essentially of a window of clear plastic assembled in a polished metal housing. A special oil-proof synthetic gasket insures oil-tightness between window and frame. Two holes in the metallic background give easy passage to the oil. Utilizing the tool illustrated, the oil window unit may be pressed safely into a reamed hole in the machine casting. The oil window unit is available in sizes to give a clear window diameter of 5/8, 1 and 1¼ in., respectively.

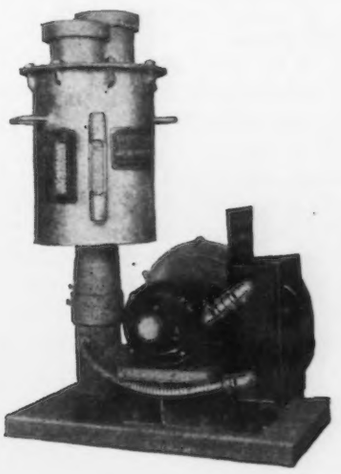
Fume and Water Tight Support

A NEW fume and water tight support for taking air, oil, and hydraulic lines, electrical cables, remote control castings, etc., through a fire wall or bulkhead has been announced by *Arena Controls, Inc.*, 2253 Halsted Street, Chicago. This support, called the Dure-Grom, eliminates many quick disconnect and firewall fittings. It slips over a line, cable or tube and fits snugly against the wall. This device consists of two parts: An oil resisting synthetic rubber disk and a cadmium plated steel cup retainer for securely attaching the grommet to the wall. The opening in the re-

tainer cup is large enough to slip over an assembled line or tube including the end fittings. Multiple lines can be supported by a single Dura-Grom, with individual openings provided in rubber disks for each line.

Anti-Moisture Tank Breathers

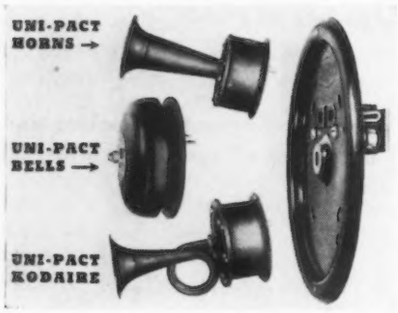
LECTROBREATHERS, developed by *Pittsburgh Lectrodryer Corp.*, 1052 32nd Street, Pittsburgh, are used to prevent the entrance of atmospheric moisture into oil and chemical tanks. They permit only dry air to enter the tank when it is



emptied or when air enters due to temperature drops. Air leaving the tank, being thoroughly dry, has a partial reactivating effect which makes possible long periods between reactivations. The units are equipped with a color indicator for determining when reactivation is needed or when it is complete. The reactivators are built for electric operation as standard for all units or for steam operation on the two larger units. These Lectrobreathers use activated aluminas, and operate on the same principle as Lectrodryer equipment.

Signaling Equipment

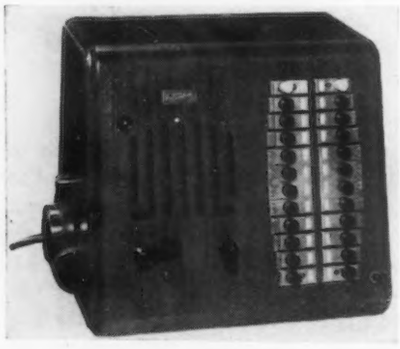
UNI-PACT is the name of an industrial signaling system manufactured by the *Schwarze Electric Co.*, Adrian, Mich. The signals are interchangeable and may be plugged into uniform adapter



plates in such a way that they may be changed without tearing out the electrical installations. Thus, a smaller bell may replace a large one, a horn may replace a bell, or a powerful trumpet may replace either one, simply by replacing equipment in the uniform fixtures. This system provides a great variety of signals, all of which fit the same plates.

Intercommunicating System

EXECUTONE, INC., 415 Lexington Avenue, New York, has introduced a new master-selector station called Model 2300, which, when joined to like stations in a system, permits direct, private two-way communications between all stations. Up to 23 stations can be used in a single system. Any two



stations can converse with each other or several may join in private conference. Either two-way loud speaking or earphone reception is provided. An automatic busy signal is provided, and each station can control its own incoming loud speaker volume.

Intercommunicating System

AN intercommunicating system known as the KS-60 super selective model, illustrated, is offered by the *Talk-A-Phone Mfg. Co.*, 1203½ West Van Buren Street, Chicago. This system is made up exclusively of master stations and permits a number of two-way conversations to be held simultaneously without cross-talk. Masters can call one another regardless of whether station being called has power "on" or not. Systems may be built up progressively beginning with two master stations to any amount of stations desired.

Many new features also have been incorporated in the design of the Super-Chief model communica-

tion system made by the *Talk-A-Phone Mfg. Co.* Conference traffic control enables any number of stations to hold a private conference without interruption or eavesdropping from other stations outside of the conference group. When one of the conference group is being called, he is signalled by a light so that he knows the call is waiting. Working in conjunction with the traffic control is the busy signal light. Each station is equipped with individual volume control to suit individual requirements.

Workman's Stand

STURDY, though extremely light, the Quick-Set stand, offered by the *Radiant Mfg. Co.*, 1140-46 West Superior Street, Chicago, can be erected in a matter of seconds and taken down as quickly. It comes in two sizes—the Quick-Set Sr., which extends from 65 to 108 in.; and the Quick-Set Jr., from 34 to 55 in. Both models feature the Radiant auto-lock and automatic tripod catch. There are no set screws, plungers, or other hand-operated devices to come loose. The stand folds into a convenient small compass and is readily portable to the place desired.

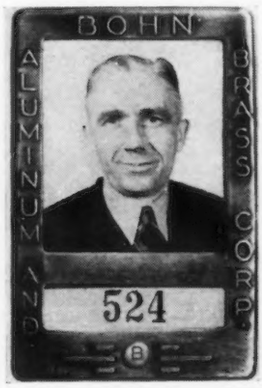
Quick-Setting Floor Patch

INSTANTUSE, a product of the *Flexrock Co.*, 23rd and Manning Streets, Philadelphia, is a ready-

mixed floor patch that enables repairs to be made quickly to ruts and holes. The floor can be used immediately without any time being required for setting or hardening. This material holds tight against the irregular edge of the original floor when applied to concrete, and smooths out to a fine feather edge.

Identification Badge

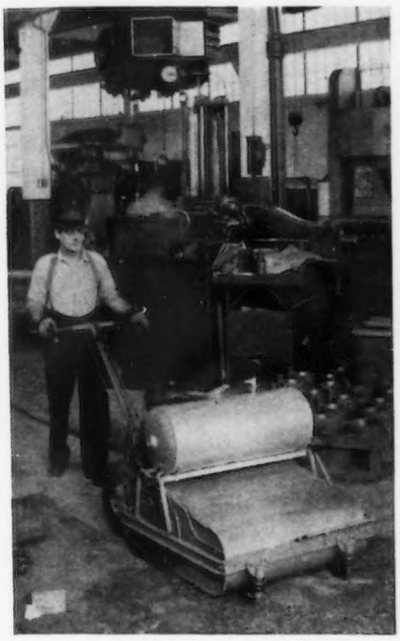
A NEW badge unit that can be re-used and is tamper-proof is offered by the *American Emblem Co., Inc.*, McMann Square, Utica, N. Y. The badge parts can be used over and over, eliminating costly practice of discarding a badge with each employee change. The design



makes possible quick changes of colored paper inserts when shifting employees to different departments. Changes of photographs and color designations can be accomplished only with a special tool furnished by the manufacturer.

Mechanized Sweeper

THE MOTO-MOWER CO., 4600 Woodward Avenue, Detroit, has adapted its tractor to the purpose of factory sweeping. The unit is easy to operate for it turns right or left under its own power



by means of a separate clutch on each wheel of the tractor, controlled at the handlebar. Heavy metal chips are easily picked up as is the lighter dust and dirt. Later models are equipped with a spray which can be adjusted so that it just lays the dust but doesn't wet the floor.

Wood Rolling Door

THE KINNEAR MFG. CO., Columbus, Ohio, announces production of an upward-acting, wood rolling door. The curtain proper is composed of wood slats suitably shaped to permit easy articulation and jointed together by

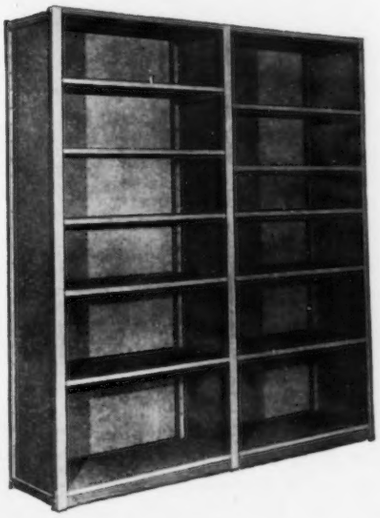
means of metal tapes or cables. It coils overhead upon a barrel, journaled in heavy cast iron brackets mounted at the corners of the opening above the lintel, and travels in heavily constructed wood guides placed at the side of the opening. Bearings are provided at the points where the curtain enters the guides. Helical springs enclosed in the barrel assure counter-balancing. Operation can be manual, by chain and reduction gearing or by motor.

Wooden Lockers

TO meet demands for practical lockers of all types, *Curtis Co., Inc.*, Clinton, Iowa, has introduced a Victory locker, made of wood. Standard size is 15 in. wide, 18 in. deep and 65 in. high with legs. Each locker consists of paneled ends, back panel, front panel including door, bottom shelf, hat shelf, top and divider partition. All parts are pre-fit for quick, easy installation. They are available as individual units or in batteries.

Wood Shelving

QUICKLY adjustable shelving is now offered in wood by *Lyon Metal Products, Inc.*, 3145 Clark



Street, Aurora, Ill. This shelving is made in open and closed types. Sections are 36 in. wide and 84 and 96 in. high, and may be had in 12, 18 or 24 in. depths. Top, base, shelves, braces, arms and uprights are made of solid hard wood. Side panels, back panels on closed types are ¼ in. plywood. They are finished with a green tinted preservative coating that reduces moisture absorption.

Synthetic Rubber Coated Gloves

EDMONT MFG. CO., 584 Orange Street, Coshocton, Ohio, have announced a new glove for women workers which offers complete hand protection against solvents, acids, chemicals, caustics and other corrosive materials.

These gloves are reinforced with a fabric lining which makes them virtually snagproof and tear resistant. They are comfortable on the hands, flexible and efficient to work with. There are two sizes—medium and large—both gauntlet type.

Protective Clothing

A NEW type of protective clothing known as Ply Garb is announced by the *Milburn Co.*, Detroit. It provides protection against water, acid, fire, alkalis and chemicals of all kinds. Made of featherweight, but extremely tough plastic laminated cotton cloth, Ply Garb sleeves and aprons offer maximum comfort and freedom of movement. The sleeves feature special air vents to guard against excessive perspiration. The aprons are available in both full-front and split-front models. The fabric is sturdy enough to resist tears, snags on rough surfaces and cracking. These garments are made for both men and women.

Anti-Fog Lens Pencil

TO help keep safety goggle lenses from fogging, *American Optical Co.*, Southbridge, Mass., announces a new type of anti-fog lens pencil. The new compound, according to thorough laboratory tests, secures superior anti-fogging results for a longer period of time than former types, and thereby adds to the efficiency of men working in steamy surroundings. In addition, the pencil itself lasts longer without crystallizing and crumbling.

Safety Hat

A NEW safety hat, made of laminated bakelite, and known as the type "P" hat, has been introduced by the *B. F. McDonald Co.*, 1248 South Hope Street, Los Angeles. This hat is light and resistant to heavy blows. Adequate ventilation keeps the head cool in

hot weather. The headband is fully suspended to provide a cushioning hammock against the shock of heavy blows. The hat may easily be cleaned or sterilized by steaming or any other preferred method.

Eye Shield

A NEW type lightweight eye shield which, in addition to giving eye protection, has a quarter dome head shield made of fiber which provides a certain amount of hair protection has been announced by the *Standard Safety Equipment*

Co., 232 West Ontario Street, Chicago. The headgear can be supplied with a leather sweatband or cellulose sponge. It is also available without the quarter dome protection. Entire front can be raised or lowered conveniently.

Hair Guard for Woman

THE StaSafe Hairgards, designed by the *Standard Safety Equipment Co.*, 232 West Ontario Street, Chicago, come in three styles and are a definite protection when worn by women drill press

operators, assembly line workers and in some inspection jobs. During hot weather when long hair is blown around by fans or ventilators, the hairgards will keep the hair in place. Goggles are easily slipped on or off and the mesh allows enough ventilation to keep the wearers head cool. The likelihood of burned or scorched hair is lessened during welding operations.

Dust Respirator

TO save metal for war production, the M.S.A. Comfo dust respirator, made by the *Mine Safety Appliances Co.*, Braddock, Thomas and Meade Streets, Pitts-

burgh, has been redesigned with filter cases of black plastic. The new filter container units are thinner, with rounded edges, permitting even better sidewise and downward vision. The filter cases have high impact strength with no electrical conductivity. They are not affected by perspiration. The unit is easy to clean and maintain, and is available in types to meet various dust and moist conditions.

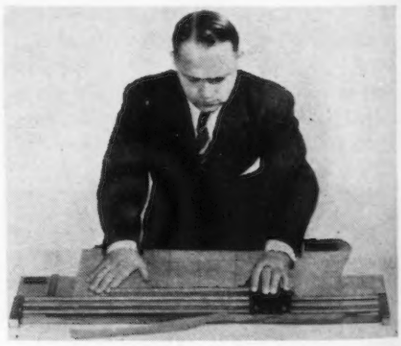
Photographic Unit

A COMPACT photo-taking unit, complete in every detail, yet so mechanically correct and simple in design that employees can be rapidly photographed right in a plant, is offered by *Prentice Products Co.*, Paramount Building, Fort Wayne, Ind. The unit has all necessary adjustable features for taking

pictures for any size badge or pass card. It is completely collapsible and portable and can be set up ready for use in 10 min.

Blueprint Trimming Machine

A NEW machine for trimming blueprints, drawing papers, etc., has been designed by *Edi Trimming Machines*, 609 West 115th Street, New York. The material to be trimmed is automatically held in place by spring hinges placed on the rail guide. Cutting is performed back and forth by two razor blades held on a sliding block and secured



in place by nuts in a protected arrangement. The table is calibrated to provide margins around the frame from 3/8 to 2 in. The trimmer is made in four sizes, from 32 in. over-all with 25 in. cutting size, to 62 in. over-all with 55 in. cutting size.

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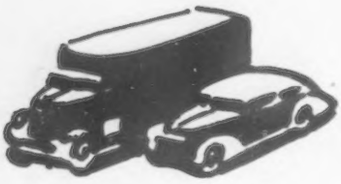
Assembly Line . . .

• Wolverine announces details of tube spinning process . . . Aluminum Co. tours country with exhibit featuring post-war uses for aluminum, the future low-cost metal.



DETROIT—Spinning of tube into closed or partially closed ends, a problem for the metal working industry in the past, has been accomplished by a new process. The Wolverine Tube Division, Calumet and Hecla Consolidated Copper Co., already has licensed it to more than a score of other companies, and has in the accomplishment produced metallurgical improvements.

Engineers who sought for many years to feed tubes into gradually narrowing apertures of forming dies were confronted with folding and cracking of the piece. Walter P. Hill, experimental engineer of the Wolverine Tube Division, working on the problem to meet a refrigerator manufacturers' specification, theorized that if he could see where and how such flaws developed he might be able to overcome them.

He drilled a hole, which looked into the open center of the forming die, but when he fed the metal into it he could see no breaks. So he drilled another opening nearer the base of the chamber, but there was still no flaws to be seen. When he finally had drilled a hole into the extreme end of the chamber, and spinning had produced a perfect closure, he realized that the openings themselves made possible the successful job. Some phenomenon of metal expansion and contraction as it passes across the open sector of the dies, together with the heat dissipation qualities thereby afforded, appears to provide the key to the riddle.

The principle involved is so broad that the patent office issued a basic patent to the inventor, and the War Production Board has honored him with a WPB Merit Award, characterized as an industrial equivalent of the Congressional Medal of Honor given war heroes.

END products are the equivalent of those developed by deep drawing, swaging, machining on screw machines, or welding. Both ferrous and non-ferrous metals can be formed by the method. At the same time the crystalline structure of the metal is refined to the point that in copper and brass tubing the dead soft condition obtained provided an ultimate degree of malleability. Ductility achieved from the process is said to be as advanced over that of drawn metal as drawn metal is over cast.

Virtually any design of end can be accomplished by employment of differently shaped forming dies. The closure need not be complete; it can be left open, or the inner diameter can be folded back within itself as may be desired. This applies to brass, copper alloy and aluminum, as well as to steel.

Success has resulted when working with exceedingly thin-walled tubing. Perfect operations have developed in two-inch copper tubing with .016 in. wall, and on 3 in. tubing with 0.025 in. walls—sections of such delicacy that extreme care must be taken in any kind of machining.

Dies for the process are ultra simple; their cost cannot be compared in the same breath with the expense of equipment which would be required for any other processes to bring about similar results. Tool life, too, appears incomparably long, inasmuch as wear merely deepens the aperture of the tool and can be compensated for by lengthening the feed.

The forming dies utilized to bring the open end to a closure, semiclosure or neck can be made of virtually any high speed steel held within 50 to 60 Rockwell C hardness, the preferred level being around 57 Rockwell C. It has been found that the use of harder dies results in their breakage, but interesting in this respect is the fact that several such broken dies are now being used for production work, fitted together like jigsaw puzzles along their cleavage lines and clamped into place. Utilization of such broken dies, of course, is possible only when specifications for the work permit inclusion of very minor scratchings developed by the cleavage lines. Wolverine officials report that they have never yet had to discard one of their spinning dies.

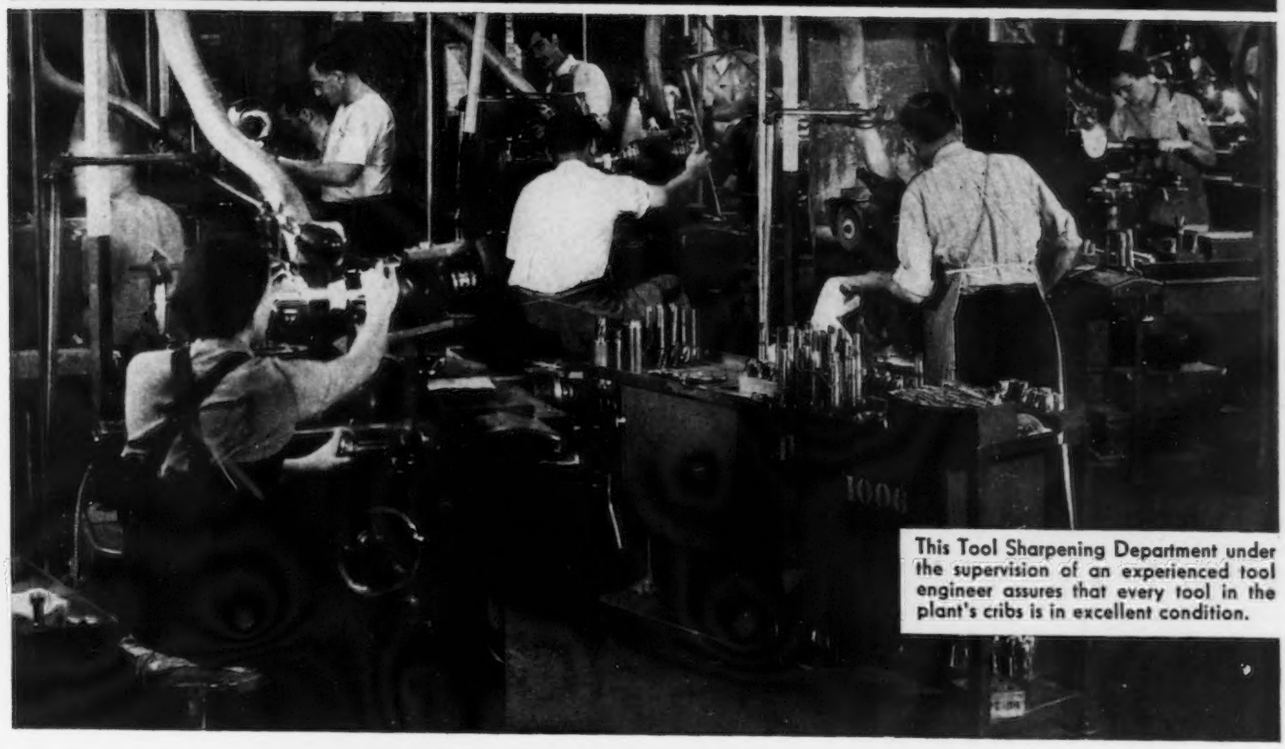
Automatic machines of various types have been developed, making continuous operation possible. Nearly any machine which embodies a feeding arrangement, a clamp to hold the work and a feed to move it forward, plus a means of spinning the forming die, appears to be all that it required.

The work may be held stationary and the die turned or the reverse. Speeds of 150 rpm. up to a maximum of 1700 rpm. have been employed, optimum for most applications seeming to be around 1250 rpm.

THE first contact between the tube and the forming die produces nearly instantaneous heat in copper and brass tubing (on which the bulk of the Wolverine research has centered thus far) and brings it to a temperature between 1200 and 1300 deg. F. In larger dies a heat ring, accomplishing initial contraction, is held flush against the rest of the die; in smaller applications there is no separate heat ring, the entire die being in one piece. As the work moves past this heat forming area farther into the contracting chamber of the shaping die, the open area cut into the side affords the heat dissipating means required to make the operation a success. Occasionally some small turnings of metal are sheared off. In the working of copper the open area of the hole is approximately ¼ of the diameter; in brass it is 1/3. For aluminum there are two openings, each about ¼ of the total area. The work is moved in either manually or automatically, and moved out almost at once.

In the impromptu annealing developed by the sudden heating, a marked refinement of grain struc-

Tool Conservation begins in the Tool Crib



This Tool Sharpening Department under the supervision of an experienced tool engineer assures that every tool in the plant's cribs is in excellent condition.

GET ALL THE *Good* OUT OF *Good Taps*

This grinder located in a tool crib of a large aircraft engine plant is used for emergency sharpening and "touch-up" jobs.

Maintenance of tools in proper working condition multiplies their life many times. Even those which have become badly worn, rusted or chipped — that seem to have outlived their usefulness — may often be salvaged to give valuable additional service.

Many large plants maintain separate tool sharpening and salvage departments. But the small shop or departmental tool crib may easily do an outstanding job if equipped with a small grinder and a few attachments.

• • •

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
DETROIT PLANT: 5850 Second Boulevard
WAREHOUSES in New York, Chicago and Los Angeles
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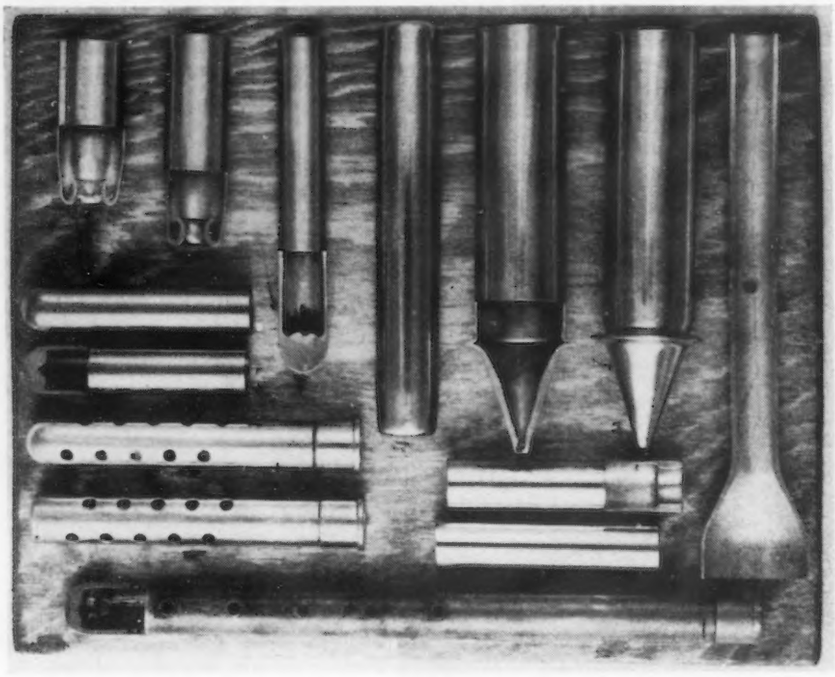
ARMY E NAVY

For helpful information on how to keep taps at peak efficiency, send for *"Greenfield's"* new booklet, "How To Sharpen A Tap."

GTD GREENFIELD

TAPS · · · · · DIES · · · · · GAGES · · · · · TWIST DRILLS · · · · · SCREW PLATES



VARIOUS EXAMPLES of types of closure possible with the spinning process of Wolverine Tube. Here are typical end cross-sections of unusual formings on a burner for a Navy job, tripod legs and a long reduced section made from light wall tubing. Others are primer tubes, and an orthodox version of a primer.

ture is accomplished. Copper of 100 mm. granular size suffers elongation of the grain when drawn, but it still remains 100 mm. This grain size can be reduced to 30 mm. by normal annealing at 1250 deg. for about 30 min. In contrast to this the Hill-Wolverine spinning process achieves a 10 mm. grain size, affording more ductility, in the space of the second or so in which the operation is performed. This permits a great deal more forming than would otherwise be possible, following the making of the closure. Punch press operations can follow the spinning and modify the shape as may be desired.

Since licensing the process, virtually no rejections have been reported for imperfection of the spinning itself. The only rejections which have developed are those which come from sawing the tubes too short at their open ends, and this, of course, is a rejection factor which is fairly constant regardless of how the ends are sealed.

The thickness of the end closure can be held to very close tolerances simply by regulating the depth of the feed—the farther into the die the piece is fed, the deeper becomes the end thickness. In this way the annealed effect of the tubing can be compensated for; if uniform tensile strength is desired the depth of the end wall can be increased to match the strength of the thinner but harder sides.

Piece cost is notably reduced, in some instances as much as 20 to 25 per cent, without regard to the lower tubing costs. Quite obviously the development has a host of civilian and military applications alike. Wolverine expects that its sphere of activity will be most importantly expanded as a result of the development, particularly after the war when supplies of metal are once more adequate for all uses.

In the 15 or 20 applications developed thus far there is a wide gamut of variety. Manufacture of tripod legs may be a case in point. Hitherto a threaded fitting, a screw machine part, was soldered over the open end of the tubular member, and a machined point was screwed into it. The new process eliminates all such fittings and machine operations. The necessary point is formed simply by pushing the tube into the spinning die and building up a mass of metal at the end, shaped as desired.

A tubular aircraft part, with a sharp reduction in diameter to form a long neck, was formerly made by welding two tubes of different diameters, with the end of the smaller tube flared to match the diameter of the larger. The part is now made of a single tube which is spun down to the smaller diameter.

An aerial required for the communications services consists of telescoped sections, the ends of which must be held to .0005 in. tolerance. By spinning the ends of these sections and utilizing mandrel control of the inner diameter a perfectly machined job is accomplished. Tolerances, however, can be held even closer than that. Some small pieces have been held within .0002 in.

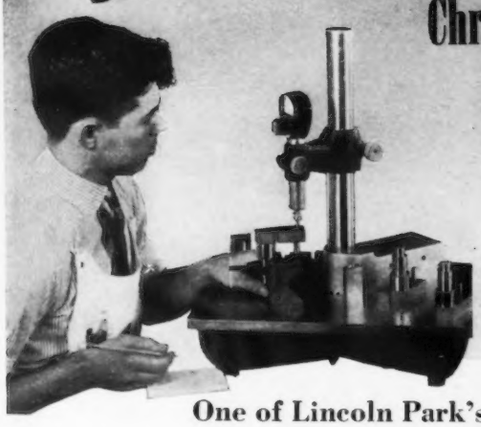
ALUMINUM CO. OF AMERICA is traveling the country with a large scale exhibit being shown to manufacturers and merchandisers in many fields as suggestions for post-war planning. Most of the exhibit is built around various types of finishing techniques, many of which originated before the war began and some of which have been casual laboratory developments since.

Anodizing of aluminum sheets is the basis for finish treatments, acting to rustproof and protect the aluminum at the same time that surface hardness is most considerably increased. One of the choice bits of this traveling exhibit is a plate, half of which was anodized and half left untreated. An abrasive brush was spun on this square for several thousand revolutions, after which a notable groove was worn in the untreated section, perhaps .010 to .020 in. deep, while the other side is merely discolored and not at all worn.

Metallic lusters and other colored oxide finishes can be plated over the anodized surface, generally in thickness of approximately .0005 in. Such electrolytic oxide finishes appear to bond most intimately with the aluminum.

Based on the belief that post-war aluminum will be at least as low-priced as copper, and likely will come down into the price range of some of the better steels, Aluminum Corp. is anticipating a wide variety of uses for its product. Expectations are that some refrigerators and stoves may be made entirely out of aluminum, coated where desired with a finish which gives it the appearance of porcelain enamel.

PUT YOUR WORN SURFACE PLATES *Back Into Service*



Chrome Plate Salvaging Provides:

GREATLY INCREASED LIFE

A HARDER, MORE PRACTICAL SURFACE FOR ALL SET-UPS

One of Lincoln Park's most recent developments is the salvaging of worn surface plates by chrome plating. The process includes the reworking of the old surface which is then chrome-plated and lapped flat. This work is limited at the present time to plates not over 18 inches by 24 inches.

Since chrome plate offers much greater wear-resistance than the materials ordinarily used in the manufacture of surface plates, the increase in life and unvarying accuracy of the salvaged plate is obvious. Of equal importance is the harder surface which is obtained. Precision checking instruments can be moved more smoothly over the chrome-plated surface, improving and speeding up inspection operations. Under normal conditions, the plating resists rust which is often prevalent on cast iron surface plates.

By taking advantage of this salvaging service, you do not consign your old surface plates to a scrap heap. You put back into service a plate which offers a much longer service life than surface plates made of the usual materials—effecting a definite saving in metals which rate high on the critical list.

Lincoln Park does not manufacture new surface plates.

ARMY E NAVY

LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

Washington . . .

• Ickes develops new itch for Nelson's control over raw materials . . . WPB would schedule components, not end products . . . RFC may finance hot topping equipment . . . Army salvages overseas scrap.

Harris and Ewing

FIRST CONFEREE: Immediately after being sworn in as OPA Administrator, Prentiss M. Brown held a short conference with Secretary of Agriculture and Food Administrator Claude R. Wickard.

WASHINGTON — Congressional committees which can be and often are useful instruments in checking up on malpractice in executive agencies have loaned (too frequently of late) their influence to special interests. The special interests are not always private. Sometimes committees permit themselves to be taken in by the heads of government departments who have axes to grind.

The recent report of the Senate Committee on Small Business, questioning whether a war materials director should be appointed with separate authority over metals is a case in point. The fact is that Secretary of the Interior Ickes has a new case of itching fingers—fingers that itch to grab authority over raw materials from WPB Chairman Donald M. Nelson. It will be recalled that Mr. Ickes once tried to get the Forest Service away from Henry Wallace when the latter was Secretary of Agriculture.

Now Mr. Ickes has decided to make public a vendetta he has been waging for a year with WPB over metals. He told the Senate Committee that "old concepts, thread bare business and financial habits and attitudes, ancient administrative procedures, that block the way must be boldly reshaped or removed." The committee report, published several days later, McCarthied this sentiment by saying that the committee questioned whether WPB has been able even to "centralize procurement and production."

MR. ICKES publicly has implied WPB is too greatly influenced by industry and has privately excoriated Mr. Nelson saying that WPB is "fostering monopolistic interests." Mr. Ickes wants to put over his Bureau of the Mines plans for the production of sponge iron, manganese, alumina, etc.

He told the committee:

"The problem of furnishing raw materials for all American industry is an extremely complex one that is limited not only by technological problems but more particularly by the economics of mineral supplies, as these have been influenced by the operating structure of large industrial enterprises. This nation with its apparent unlimited wealth of minerals in past years has crooned itself into thinking that it need only concern itself with the largest and richest ore deposits.

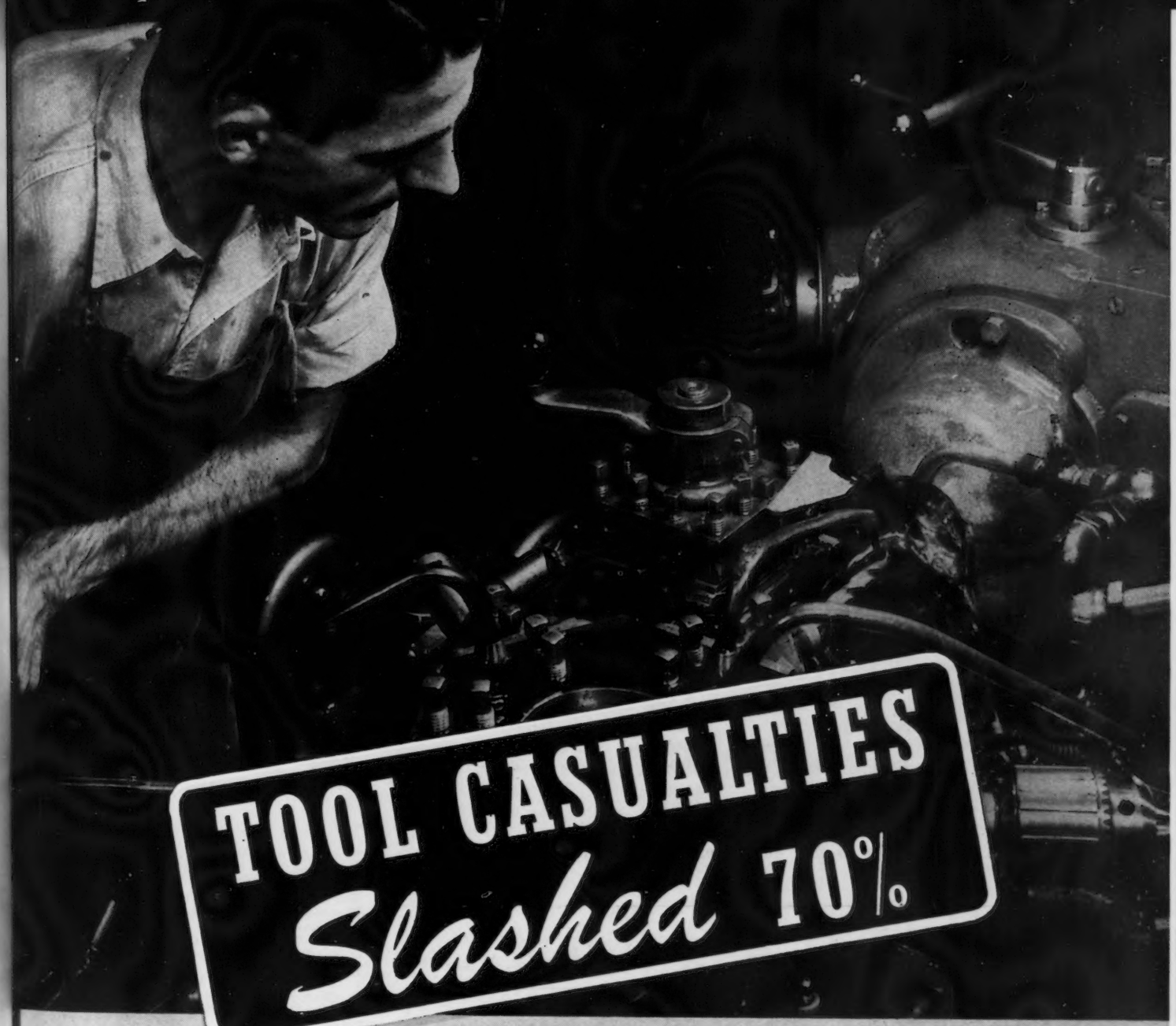
"I believe that the technologists of the nation are not as yet giving sufficient attention to certain processes and operations which, although small in size, would be highly efficient and highly competitive. I have reached this conclusion because of the department's unsuccessful efforts to obtain support for and acceptance by war agencies of some of its competitive processes. It may be that if we freed technology from the restrictions of interlocking corporate control and the ideology of monopoly, we would reap a harvest of new, highly efficient and self-contained medium and small sized operations."

What else would be reaped is not known but some of the department's "highly competitive processes" are assigned by their inventors in the Bureau of Mines to the United States. Some of them are not. While this is perfectly legal and under the law the United States would get free uses of the processes, it is questioned by some government officials what advantage, aside from credit for increasing material supply, would be gained by the Department of Interior. The question seems valid.

* * *

War Department Versus WPB

Late information on WPB's scheduling demands from the War Department is that the board doesn't care about scheduling military end products but only wants to schedule components, such as valves, heat exchangers, electric



TOOL CASUALTIES *Slashed* 70%

SUNICUT

"Increases tool life . . . saves time and labor"

Production of vital parts for tanks, tractors and "blitz buggies" was hampered at this large automotive parts plant by poor tool life. Scarcity of small tools added to the seriousness of the problem.

Then a Doctor of Industry—a Sun Cutting Oil Engineer skilled in metal working problems—was called. He studied the conditions and prescribed a change in cutting oil—to Sunicut, the transparent, sulphurized cutting oil. Sunicut proved to be the right answer. The life of valuable small tools was prolonged by 70% . . . fewer "down times" for tool changes were required . . . production was speeded along the line.

War plants of all kinds—with a variety of cutting oil problems—are finding Sunicut's superior metal-wetting and heat-absorbing properties the answer to their metal working problem. Call in a Sun Doctor of Industry today to study your particular operating conditions . . . and recommend the correct grade of Sunicut to increase tool life and boost production in your plant. Write

SUN OIL COMPANY · *Philadelphia*

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SUNOCO

UN PETROLEUM PRODUCTS *HELPING INDUSTRY HELP AMERICA*

motors, etc. The Army appears to be resisting this effort, too.

Shortage emphasis is shifting from raw materials to components. This was forseen months ago by top WPB officials who at that time advocated scheduling as the solution. The armed services do not schedule components, and components are the production limiting factor at this time.

* * *

Hot-Topping Equipment Financing

The increased demand in 1943 for alloys has put a new burden on steel companies which have not produced any great amount of alloys in the past. It is planned to increase alloy steel production in 1943 to 18,000,000 tons. Existing electric furnace capacity did not account for more than 5,000,000 of the 12,000,000 tons of alloy steel produced in 1942—open hearths melted the rest.

TO increase open hearth alloy melting, which must be done if the country is going to get 18,000,000 tons of alloys this year, plant alterations must be made and the problem of a shortage of hot-topping equipment solved. The WPB Iron and Steel Division is proceeding with its program to this end and companies are preparing to make the necessary out-lays of money and materials. It will be less expensive, take less material and save time to increase open hearth alloying capacity than to install new electric furnaces.

However, hot-topping equipment is generally thought to be "nonrecoverable"—that is the steel companies would have no use for the alloy capacity after the war, and the expenditures for new equipment would represent losses. The possibility of governmental financing is being discussed, but discussion has not reached such a stage where it is known just how much RFC would be asked to put up.

* * *

Army Salvages Overseas Scrap

The Army's salvage operations at overseas bases already have yielded approximately 1,348,000 lb. of brass cartridges which have been returned to the United States. Materials being collected include scrap metals, tire tubes, scrap rubber, clothing, textiles and other miscellaneous items. They are being sent back to this country for further use in the war effort, the War Department has announced. It is planned that where military operations permit, salvable materials will be gathered from battlefields. These materials, however, will not be returned to the United States when disposal in foreign areas will aid in the successful prosecution of the war.

Materials reaching this country are unloaded and cleared from piers immediately and segregated into usable or repairable property and material which obviously is scrap. The repairable property is channeled into repair facilities while the scrap is sent into channels of industry for the manufacture of new materials.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

DAN IS CHIEF OF THIS DEPARTMENT AND HE'LL SHOW YOU HOW TO OPERATE THIS COLD SAW-- OH, YOU REMEMBER ED. DON'T YOU, AND ALEC-- ED'S CHIEF OF ASSEMBLY AND ALEC IS CHIEF OF MAINTENANCE... AND HERE COMES DICK
YEARS AGO HE SAID "BAH! ME LEARN TH' MACHINIST TRADE? ME BE A GREASE MONKEY? I'M GETTIN' INTO SOMETHIN' WITH A FUTURE-- THERE'S NO OPPORTUNITY IN A DIRTY SHOP!" HE WENT INTO SOMETHIN' THEY DON'T NEED NOW, AND IT'S GOIN' TO BE HARD TO TAKE ALL THESE SCHOOL CHUM CHIEFS AROUND HERE!
T. M. REG. U. S. PAT. OFF. COPR. 1943 BY NEA SERVICE, INC.
THE MEN OF THE HOUR
J.R.WILLIAMS 1-29

Cited for Award

• • • **The following** additional companies recently have been awarded the Army-Navy "E" for outstanding performance on war work:

Barnes-Gibson-Raymond Division of Associated Spring Corp., Detroit.
Blueridge Co., Inc., Glasgow, Rockbridge County, Va.
Broad Brook Co., Broad Brook, Conn.
Chicago Pneumatic Tool Co., Cleveland Plant, Cleveland.
Ciba Pharmaceutical Products, Inc., Summit, N. J.
E. I. du Pont de Nemours & Co. Dye Works, Deepwater Point, N. J.
A. B. Farquhar Co., Ltd., York, Pa.
Fidelity Machine Co., Philadelphia.
Fleetwings, Inc., Plant No. 1, Bristol, Pa.
Hussman-Ligonier Co., St. Louis.
Illinois Tool Works, Chicago.
C. O. Jelliff Mfg. Corp., Southport, Conn.
Kelsey-Hayes Wheel Co., Jackson Plant, Jackson, Mich.; McGraw Plant, Detroit; Military Plant, Detroit.
Martin Dyeing & Finishing Co., Bridgeton, N. J.
Michigan Maple Block Co., Petoskey, Mich.
Midwest Mfg. Co., Galesburg, Ill.
Pipe Machinery Co., Cleveland.
Pratt & Letchworth Co., Inc., Buffalo.
Ripon Knitting Works, Ripon, Wis.
Simonds Saw & Steel Co., Intervale Plant, Fitchburg, Mass.; North Street Plant, Fitchburg, Mass.
Specialty Mfg. Co., Houston, Texas.
Stoner Mfg. Corp., Aurora, Ill.
Texas Washer Co., Houston, Texas.
Tools & Gages, Inc., Cleveland.
Triangle Package Machinery Co., Chicago.
Trailer Co. of America, Cincinnati.
Vermont Tap & Die Corp., Lyndonville, Vt.
Vinco Corp., Detroit.
Wannamaker Chemical Co., Orangeburg, S. C.
Wittek Mfg. Co., Chicago.
Fairbanks, Morse & Co., Freeport, Ill.
Babcock & Wilcox Co., Augusta, Ga.
Monsanto Chemical Co., St. Louis, and Monsanto, Ill.
Crane Co., Chicago.
Republic Steel Corp., Canton and Massillon, Ohio, and Birmingham and Gadsden, Ala.
Howard Foundry Co., Aluminum Division, Chicago; Magnesium Division, Chicago; and Bronze Division, Aurora, Ill. (renewals).
Bucyrus-Erie Co., Erie, Pa.
Union Wire Rope Corp., Kansas City (renewal).
Keokuk Electro-Metals Co., Keokuk, Iowa.
Allis-Chalmers Mfg. Co., Springfield, Ill.
Babcock & Wilcox Co., Refractories Division, Augusta Works, Augusta, Ga.
General Electric Co., Ontario, Cal.

the light metal age is born . . .

The Stone Age, the Bronze Age, the Iron Age, the Steel Age — these four great ages span the history of man.

Today, we are at the dawn of a fifth. Out of this war, the greatest conflict the world has ever known, the Light Metal Age is being born.

Magnesium is one of the lightest metals known. One pound will do the work of one and one half pounds of aluminum and five pounds of copper, and magnesium alloys have been developed with an ultimate strength of more than 60,000 pounds per square inch.

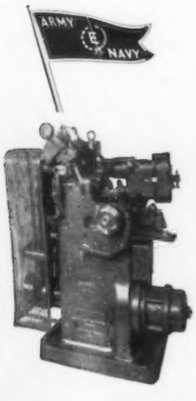
Before the war there was only one magnesium and one aluminum producer in the United States . . . after the war there will be as many as ten magnesium producers and four aluminum producers! What's more, these metals are among the most abundant of all, and full production should reduce the prices of both to levels never dreamed of before.

Likewise in steel, in just two war years our capacity for electric-furnace steel has increased an incredible 85%, and new lightweight superstrength alloys have been developed which can now be welded, with great savings in costs and time.

What does all this mean to the post-war world just ahead? It means that aircraft, automobiles, trucks and trains will be lighter, stronger and cheaper. It means that rivetless ships will slide off the ways, and rivetless planes will roll off the lines. It means greater speed and lightness and strength and economy.

And it means *problems!* Problems in production, in fabrication, in tooling and in design. Problems in the new light metals of the new Light Metal Age!

Bryant engineers are among the foremost authorities in America on problems involving machine tool operations with the new light metals. Send us *your* problems now!



SEND FOR THE MAN FROM BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

WEST COAST . . .

• Unscheduled sinking of tanker at outfitting dock provides fuel for much discussion on the Coast . . . Economic rather than patriotic conversation found dominant among workers after shop hours, offering tip to those crusading against absenteeism.

SAN FRANCISCO — Seldom outdone by other strata of society, and never bested without an effort, industry—the West Coast sector—grunted valiantly in an effort to knock the Flynn trial off the front page last week, but failed miserably. Easy living and a general letdown in morale after a year of preparatory appearances in the picture magazines had taken their toll. The general impression prevailed that the "silly season" was on in real earnest.

The debacle started with the unscheduled and unaided sinking of the tanker "Schenectady" at the Kaiser Co.'s outfitting dock in the Willamette River near Portland. Inasmuch as the scene of the incident is several score miles from the open sea, the mishap obviously could not be charged to enemy submarines. Previous acceptance by the Maritime Commission counted heavily against those who would have been happy to have pointed a finger of accusation at the ship's builders, and the real cause is more likely to leak out in the pages of technical magazines than in official statements to the public press.

The particular area of the country in which the Schenectady met its end seems fated to bring embarrassment to the engineering profession, if one may recall the Tacoma Narrows Bridge which blew down in a wind storm shortly after its completion in 1940. The advanced theory that the vessel cracked in the middle clear down to its keel because it came to rest on a sand bar created by the recession of storm waters may have an element of truth, but one which is inconsequential in considering the structural failure of a ship which had been properly inspected and deemed to be seaworthy. The theory that new chapters may be written in the science of welding and the inspection of welded materials finds more merit among the shipbuilding fraternity here. The failure probably did not occur on the weld which runs straight down the side of vessels following this prefabricated design because of prefabrication, but in the adjoining plate areas. From the structural standpoint, if this is true, changes may have to be made in designing prefabricated sections in order to avoid such a strip of brittleness along the joining weld.

AS a matter of fact, despite the substantial element of truth in the assertion that welding is entirely responsible for the phenomenal speed with which vessels are being built these days, only one Coast yard, to our knowledge, is turning out completely welded ships, without any rivets whatsoever. That is Western Pipe & Steel Co. whose South San Francisco yard adjoins Bethlehem Steel Company's mill there. The performance at this yard has not attracted national publicity because its work involves the construction of vessels for the Maritime Commission's long range program and some conversions of a type concerning which it is not considered fashionable to talk or write these days. Neither of these types of work lends itself to speed records or highly publicized ceremonies. The conversion work has encountered considerable delay because of difficulty in securing material which could not be scheduled long in advance. These material difficulties may now be spoken of in the past tense, however. Because the Western Pipe & Steel Co. yard was one of the first to participate in the Maritime Commission's long range building program, and was in operation well before the war emergency, it currently is blessed with a more stable labor force than some of the yards manned by a large proportion of previously inexperienced workers. Production per man and man hours per vessel are reduced by well trained foremen and a settled organization. The attitude of realism in the Western Pipe organization is further exemplified by the noticeable absence of complaint about labor turnover and absenteeism.

The current crusade against "absenteeism" is a prominent symptom of the paucity of real morale progress during the past month, which has forced public relations departments to clutch at straws. If these front office boys who appeal to patriotic motives will take the time to stop in at the corner saloon one or two nights a week, they will learn that economic rather than patriotic topics dominate the conversation despite all that has been said and written. Bearing this in mind, figures of the San Francisco office of the Maritime Commission, which show that no yard in this vicinity averages more than 8 per cent absenteeism and that the others run as low as 2.4 per cent are not discouraging. Compared

First Coke Plant on Coast Partly Running

Pittsburgh

• • • Completion of a portion of the first metallurgical coke plant on the west coast was announced last week by Koppers Co. Engineering and Construction Division. The plant is made up of two batteries totaling 90 Koppers-Becker Coke Ovens of the latest design and includes equipment for recovery of all usual by-products. Built in the San Bernardino Valley for the Henry J. Kaiser Co., Inc., the ovens will furnish more than 900 tons of coke daily.

Coal was charged on the first battery of ovens last month (December). Wherever possible concrete and wood were used in the construction.

By-product equipment provides for recovery of tar, ammonium sulfate, benzol, toluol, xylol, solvent naphtha and phenols, including the extraction of phenol from waste liquors.

"It's a Job For EX-CELL-O THREAD GRINDERS.

. . . these threaded parts must be hardened and ground to *precision* tolerances . . . and produced plenty fast!"

SINCE EX-CELL-O introduced the original production thread grinding machine seven years ago the standard for threaded work has definitely risen. Closer tolerances are now demanded and maintained. The use of harder and heat-treated material in the making of threaded parts no longer presents difficulties. Numerous parts today have threads ground on them directly "from the solid" (often, where the pitch is a relatively fine one, in a single pass). . . . For instance—*precision thread grinding* is the preferred method today among aircraft engine builders for finishing threads on parts such as crankshafts, engine cylinder barrels, crankshaft bearing and connecting rod bolts, tappet adjusting screws, various studs and many other threaded parts. With work pieces of ample threaded length, frequently one operator conveniently handles two or more EX-CELL-O thread grinding machines. . . . *All of which means important savings in production time!*

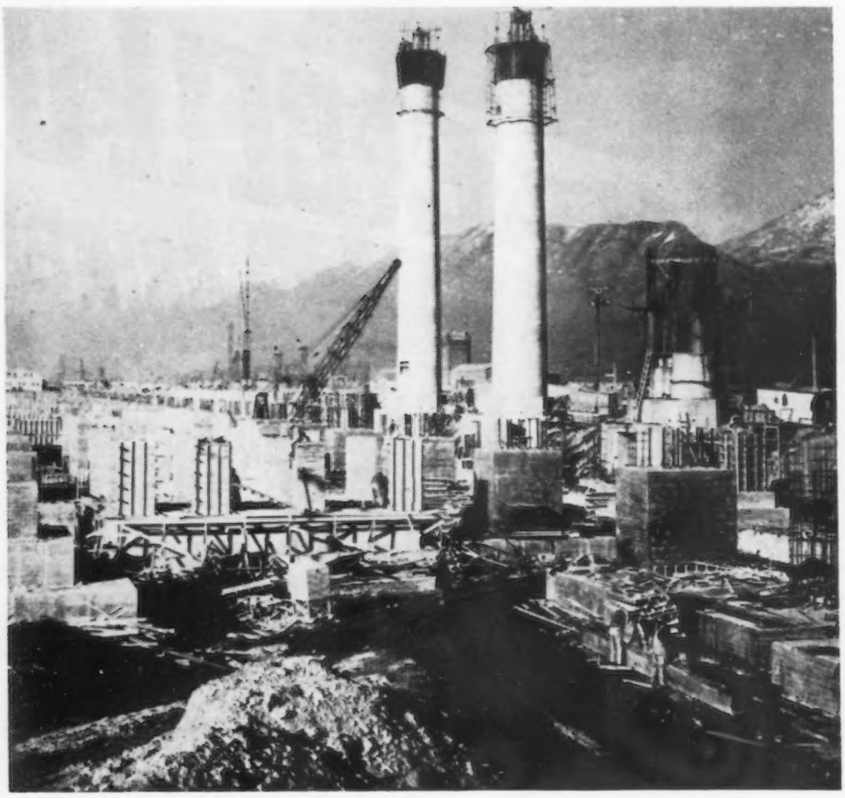
EX-CELL-O CORPORATION • DETROIT

This EX-CELL-O book on Thread Systems, Forms, and Measurements contains much practical information for all those using Precision Thread Grinding Machines. A request for a free copy, on your business letterhead, will be given immediate attention. Address Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit, Mich.

Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PRECISION PARTS

XLO

EX-CELL-O *means* PRECISION



SMOKE STACK SENTINELS: Nine open hearth furnaces with towering smoke stacks rising from the landscape are under construction at the $150,000,000 Geneva Steel Works, now being built by Columbia Steel Co., subsidiary of U. S. Steel Corp., for the Defense Plant Corp., near Provo, Utah. This recent photo shows two of the smoke stacks near completion.

with last October, they are an improvement. The yards at the favorable end of the scale show an absentee record better than average during peacetime when work was thin.

IN aircraft plants, the so-called absentee problem has very much the same aspect. It has been stated that absenteeism and labor turnover took a sharp jump immediately following the first pay checks from which the victory tax was deducted. Some fancy figures can be quoted if special occasions are picked. On the day after Christmas, 26 per cent of the Boeing employees failed to come to work. Douglas counted about 12 per cent of the total payroll absent one day. But for the California airframe industry, as a whole, average production loss is only about 7 per cent, according to the Aircraft War Production Council. Worker reaction to continual harping on the subject in the public press and house organs has not been enthusiastic, and if anyone is really curious as to what the radical fringe of labor thinks about the campaign, recommended reading includes an editorial appearing in the Jan. 18 issue of *The People's World*, which speaks on the West Coast for the Communist Party line, and which has been enthusiastic for an Allied victory ever since Russia changed sides.

A tacit admission that the realistic, dollars-and-cents, selfish approach can best curb absenteeism was authorization by the Tenth Regional War Labor Board to Consolidated Aircraft Corp. at San Diego to try a $10,000 monthly distribution of war bond prizes to employees qualifying under an attendance schedule. Since Consolidated reports a 10 per cent daily loss of man hours, equivalent to 3600 trained employees and 700,000 man hours lost per month, a $10,000 war bond inducement is an economical remedy to a costly loss. The board reserves the right to review the plan after a month's trial. Tentatively the scheme contemplates selecting 73 employees from approximately 40,000 on the basis of individual attendance and average attendance of the crew to which selected employee belongs. The capital prize will be $1000 and the lowest prize $25.

Announcement by the War Manpower Commission of inauguration of its stabilization program in southern California is another aspect of the "make believe" attitude rampant just now. The program is the same as that inaugurated in Detroit and other critical labor areas, and, in general, is patterned after the guinea pig bred in San Francisco Bay area shipyards some months ago.

A similar attempt to "chill" workers in essential mining and logging, inaugurated by the War Manpower Commission in an effort to stop migration within these industries but more especially to stem the general exodus to other types of employment late last summer, was announced as a freeze order, but has turned out to be almost a complete frost. The plan may have looked good on the policy mapping tables of Washington, but lack of realistic knowledge or consideration of conditions within these typically far western industries prevented it from ever becoming an operating success.

Operating at a 16 per cent overload, generators at Bonneville and Grand Coulee Dam have reached a power production peak, pouring 729,000 kilowatts into the Pacific Northwest power system. Rated capacity of the generators installed so far is 626,400 kw. Of the peak output, 531,000 kilowatts went principally to heavy industry in the region served by the big publicly owned power system, setting some kind of a record for a territory that prior to the war was considered puny industrially.

Prediction of expansion of West Coast plants to produce castings, valves and hawse pipes, long critical items in shipbuilding on this Coast, was made by J. K. Doolan, general manager of California Shipbuilding Corp., after a half-hour's "brass tacks" conference with Vice-Chairman Charles E. Wilson of WPB and other top drawer public production executives. This local supply will offset current grave delays in transportation from present Eastern sources.

Introducing..

A Houghton Salt Bath for Quenching War-Time Steels

HOUGHTO-QUENCH NE

ADVANTAGES:

1. *HOUGHTO-QUENCH NE possesses a rapid quenching speed through the critical zone from 1300° to 1000° F.*
2. *It has a low melting point.*
3. *It is a fluid, low-viscosity salt having high thermo-conductivity.*
4. *It is stable . . . non-sludging . . . unharmful to the surface of steel.*
5. *It has minimum carry-away losses.*
6. *It is easily cleaned from the steel.*

Designed for the new MARTEMPERING* Process

The usefulness of "lean" alloy NE steels can be extended by use of drastic quenches without serious trouble due to quench-cracking and distortion. Maximum physical properties can be developed with safety by the Martempering process especially on "lean" alloy steels which have been increased in hardenability by the use of higher carbon content.

Quenching from austenitizing temperature into an agitated, fluid, salt bath at 400° F., holding until the temperature is equalized throughout the piece, removing and allowing to cool in air, results in a minimum of residual stress. If the critical cooling rate has been exceeded, full hardness will be obtained.

Houghton has developed a special salt bath material of low melting point and low viscosity for this purpose. It is stable and non-corrosive, cleans easily. For full details of inexpensive furnace construction and controls, see the Houghton Service Engineer, or write direct to—

E. F. HOUGHTON & CO.
PHILADELPHIA
Chicago — San Francisco — Detroit

***MARTEMPERING** is the term applied to the quenching of low alloy steels in liquid baths at elevated temperatures to produce a martensite structure. This process develops maximum physical properties without distortion, cracking or residual hardening stresses.

THE HOUGHTON LINE
OF PRODUCTS FOR THE METAL INDUSTRY

Fatigue Cracks BY A. H. DIX

Unsilent Sufferers

• • • For the past several weeks Elmer Davis has been running the Office of War Information without any help from us. And very well, too. But just to keep our franchise alive we offer the suggestion that he start a campaign against filling letters to soldiers with complaints about the horrors of life on the home front.

Henry is hardly in the frame of mind to cry in his Guadalcanal foxhole because Emma can't get enough gas to get to her Thursday night rumba class. And night guard duty on an Aleutian patrol ship prevents Bill from being properly sympathetic toward Aunt Minnie who is sure her sniffles are due to that 65 deg. regulation, and if they don't give her more heat she will move to another apartment.

Soldiers crave news from home, and the effect of war's impact on the home is news. But it should be reported "straight," with pains taken to avoid any suspicion of self-pity or of bearing up bravely in the face of great hardships. For if there is anything that infuriates the man who has given up his job, his comforts, and who may give up his life, is a whining "you-have-no-idea-of-what-we're-going-through" letter from home.

As a military morale destroyer it ranks with rumors of abnormal war profits and bonuses, and strikes called for insanely trifling reasons.

Perfect Pun

The American Propeller Corp., Toledo, calls its employees' magazine "Vox Prop." Clever, what?

—*Peirce Lewis*

Pleasant Problem

The article beginning on page 159 of the Jan. 7 issue, entitled, "Shipbuilding, Aircraft, and Women," is subtitled, "These are the three dominant problems on the Pacific Coast."

Women, it seems to me, have been and will continue to be a dominant problem anywhere.

T. F. P. Kelly, Barrett Division, Allied Chemical & Dye Corp.

A rebuke to the brains department for taking in too little territory, Errol Flynn notwithstanding. Mr. Kelly's statement is irrefutable, but if it needs support, we suggest as witnesses Julius Caesar, Tommy Manville, Adam, Mr. Wimple, and the rest of the male population from 12 to 90.

Brief Journey

I have discovered the shortest trip on record. A circular I have received, describing switches for planes and tanks, says they are guaranteed to function under a vibration of 55 cycles per second, and have an ***excursion*** of 1/16-in.

—*A.W.M.*

An excursion is a short journey, so this is a proper use of the word, even though somewhat on the expansive side. It accords with the tendency of the day to make etymological giants perform tasks suitable for pygmies. For example, there was a time when "explore" was associated only with unknown lands, but today you can explore the time-saving possibilities of installing a powder room in the north end of your shop; you can explore your inside coat pocket, or the cavity in your lower right rear molar.

Aptronym

In a Scottish town a firm of lawyers is named Messrs. Welsh and Robb.

—J. P. Young, Director,
W. H. Arnott, Young & Co., Ltd.,
Fighting Cocks Works,
Middleton-St-George, Darlington, England

We thank R. W. Parsons, chief metallurgist of the Ohio Brass Co., Mansfield, O., for the best aptronym received this year. Although unsuitable for the chaste columns of your favorite family journal it has been placed in the front row of our private collection.

Name Disguiser

• • • This page's loyal army of eighteen readers includes, by his own admission, Donald Roebling, of Clearwater, Fla., inventor and builder of the amphibian originally designed for hunting in the Everglades but now serving an important military use. Mr. Roebling proposes for membership in the secretive signature club C. N. Seidlitz, not the inventor of the headache powder, but the president of the Seidlitz Paint & Varnish Co., whose ticket of admission is:

He Looked Ahead to 2000

• • • Our blurb about your getting 53 issues in '42 moved Edward A. Wieck to work out the sequence for the rest of the century. The other extra-issue years are '48, '53, '59, '64, '70, '76, '81, '87, '92 and '98, by which time all of God's industrial chillun will have an Army-Navy E.

In a normal year you get 13 copies in every quarter, but oddly enough you will get only 12 in this present quarter. To balance up, you get 14 in the third quarter. Your interest in this phenomenon is probably feeble, but ours is enormous, for we are now being paper-rationed—ten per cent less for '43 than we used in '42—at so much a quarter. (Dear Miss Achelis: Our apologies for thinking you were a crackpot. Please send us an application for enrollment in your ever-normal calendar club.)

Onomatopoeical Error

No! No! Bells do not clank! They clang—unless, of course, you were raised on the Eastside, where you wear a rink on your finger and the end of recess is announced by the sounding of a gonk.

—*Deac*

We knew that a clank is a clang that died in infancy, but when we wrote the line, "*It would be better if Herbert N. Klank of the Klank Steel Products Co., Baltimore, made bells,*" the only thing we could think of that clanked was suit armor, and as no one is making that stuff these days we took liberties. Sorry.

"F" In Arithmetic

On page 101 of your Dec. 24 issue you say:

Rochester's cost for municipal can collection, publicity and advertising, was $1,094.81. Receipts amounted to $1,489.89, making a profit of $55.08.

I make it $395.08. What happened to the other $340?

—Elton Sterrett,
Gulf Publishing Co., Houston, Tex.

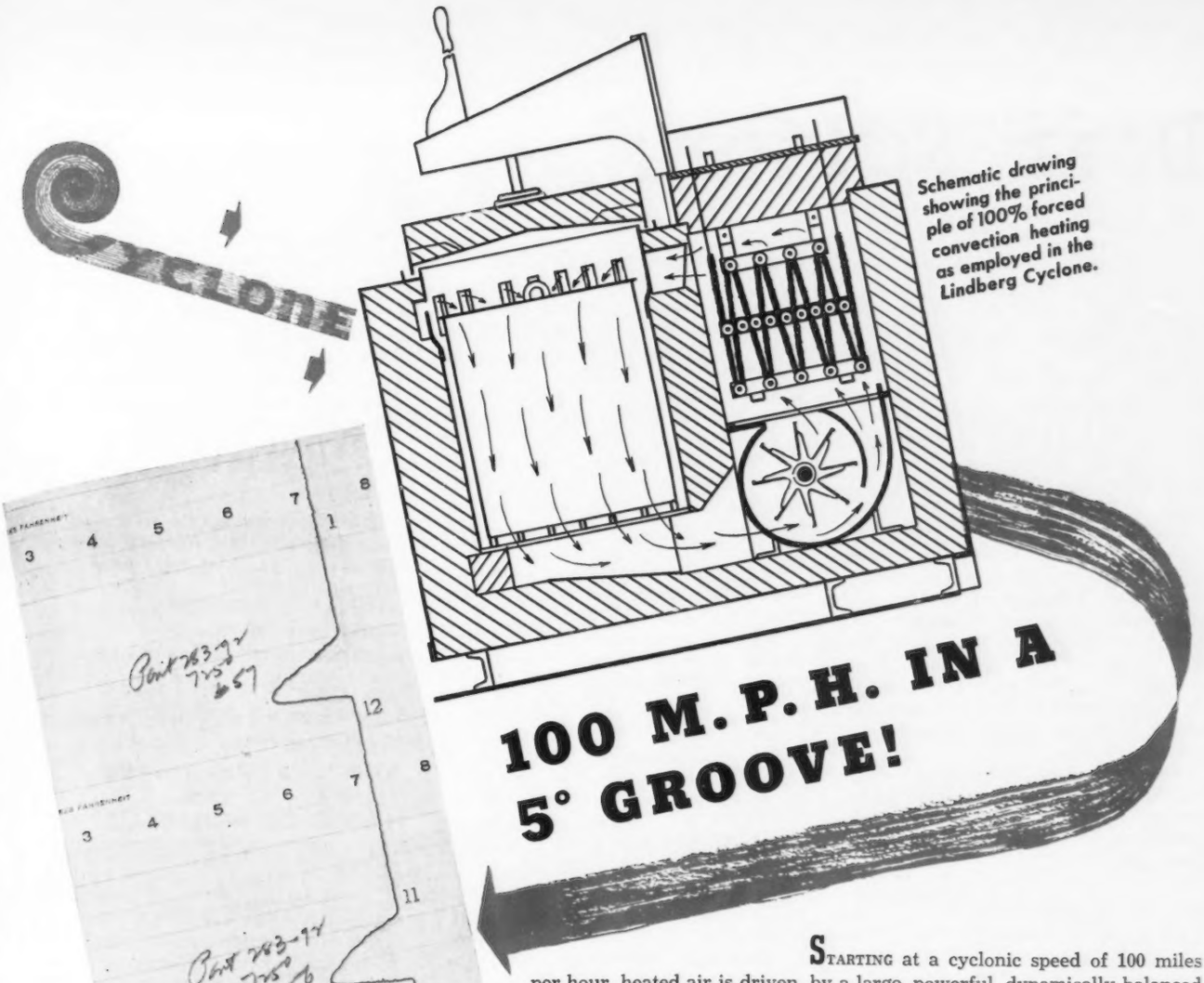
Clambake?

Problems

Last week's soldiers get home quickest by walking 1 mile along the highway, then straight across the fields (5 miles) to camp. Elapsed time is 87 minutes. Ex-Pfc G. Brick, Detroit, complains by postcard, "Problem impossible of solution pending data as to consumption of beer (time X volume)." The solution assumes, of course, that beer consumption was not enough to prevent pursuance of a straight course.

This one is from S. H. Marshall, Dominion Tack & Nail Co., Ltd., Galt, Ontario:

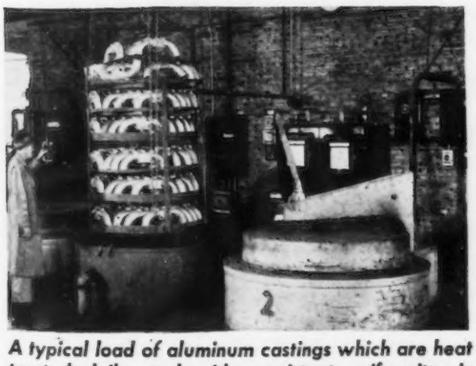
A man going on a journey left $1,000 with his son. He said that while he was away a bill would come in for some amount from $1 to $1,000, in even dollars. His son was to pay this. The father left the money in ten sealed envelopes, divided so that whatever the amount it could be paid without having to open any envelope. What was the amount in each envelope?



Schematic drawing showing the principle of 100% forced convection heating as employed in the Lindberg Cyclone.

100 M.P.H. IN A 5° GROOVE!

Evidence of accurate heating—a typical Cyclone control chart.



A typical load of aluminum castings which are heat treated daily, and with consistent uniformity, in Lindberg Cyclones all over the country.

STARTING at a cyclonic speed of 100 miles per hour, heated air is driven, by a large, powerful, dynamically balanced fan of Lindberg design, through the charge of the Cyclone Furnace, soaking each piece in an accurate, uniform heat, which is precision controlled to ± 2.5° of the desired temperature.

PIONEERED BY LINDBERG

This 100% forced convection heating principle of the Cyclone Furnace, pioneered and developed 8 years ago by Lindberg engineers, is employed today by all the leading aircraft manufacturers and subcontractors in the country for the precision heat treatment of magnesium and aluminum.

YOUR PRODUCTION SCHEDULE INSURED

Isolation of the work chamber from any damaging radiant heat source plus the accurate temperature control of the voluminous stream of heated air makes the Cyclone the perfect furnace to meet the close heat tolerances demanded by magnesium and aluminum alloys. As a natural result, production is speeded through more rapid and uniform heating and costly spoilage of vital materials is eliminated due to the accurate heating control.

The 78 different vertical type sizes and 62 sizes of the box type, allow you a wide range of selection in planning your production schedule. For more detailed information on either the box or vertical type, both gas fired and electrically heated, the appropriate bulletins will be sent on request.

LINDBERG ENGINEERING COMPANY
2452 WEST HUBBARD STREET • CHICAGO

LINDBERG FURNACES

SUPER-CYCLONE FOR HARDENING, NORMALIZING, ANNEALING, TEMPERING
CYCLONE FOR ACCURATE, LOW COST TEMPERING OR NITRIDING
HYDRYZING FOR SCALE FREE AND DECARB FREE HARDENING

Dear Editor:

OIL FOR THE MIDNIGHT LAMPS

Sir:

Since the interruption of Burma Road, air transport service into China is so limited that only urgent essential war materials can be flown in. In consequence, magazines, scientific journals and books, are no longer available to the Chinese readers. We have received numerous requests from Chinese engineers and industrial executives for information on current technical developments. To satisfy their yearning for knowledge of industrial developments in this country, we are thinking of having our engineering staff make abstracts or digests of news items and technical articles in current magazines and periodicals . . . and have them printed in a pamphlet of thin paper so that it may be sent by airmail to China.

This corporation is the official purchasing agency of the Chinese government. We write to ask for your permission to use material in THE IRON AGE.

S. D. REN,
Vice President
Universal Trading Corp.,
630 Fifth Avenue,
New York City

• **Granted.—Ed.**

BORON

Sir:

I have read with considerable interest your article entitled "Boron" in the Nov. 19 issue. Will you be good enough to furnish me with the names of the vendors of the five alloys mentioned in the second table on page 44 of the article.

THOMAS F. DAVIS
General Electric Co.,
Pittsfield, Mass.

• **Molybdenum Corp. of America, Pittsburgh**
Vanadium Corp. of America, New York
Electro - Metallurgical Corp., New York
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
Ohio Ferro-Alloys Corp., Canton, Ohio.
—Ed.

HEAT TREATMENT OF NE STEELS

Sir:

Please forward to us any data which you might have on Heat Treatment of the new National Emergency Steels, NE-8620—8949 and 8744.

P. J. ZIRKEL
International Harvester Co.,
Fort Wayne, Ind.

• **See Sept. 17, 1942 issue, pages 58-64 for the article "Physical Properties of NE Carburizing Steels" by A. S. Jameson, Works Metallurgist, International Harvester Co., Chicago.—Ed.**

PIG IRON PRICES—1837, 1943

Sir:

Some forty years ago you published the journal of my Grandfather, Otis Cary of Foxboro, Mass., about a trip which he took to New York and Pennsylvania in search for iron. When in New York, he had pig iron quoted to him at $65 cash and $70 for four months. That was on Jan. 30, 1837. On Feb. 23, 1837, he bought at Caswell and Murdocks pig iron at $62 for six months from time when the iron was shipped.

I am using that diary in a paper I want to give here and should appreciate it if you would tell me what the same iron would bring today and also a price at which it could be bought in more normal times.

REV. GEORGE E. CARY
First Church of Christ,
Bradford, Mass.

• **Today's average pig iron price is $23.61 gross ton. In January, 1939, the average price was $20.61.—Ed.**

HARDENABILITY—TOOL LIFE

Sir:

The Armory is desirous of obtaining two copies each of "Hardenability of Steel," by A. E. Focke, in the Sept. 3, 1942 issue, and "Tool Life Increased," by Thomas E. Lloyd, in your Dec. 10, 1942 issue.

E. W. THOMPSON,
Procurement Div.
Springfield Armory,
Springfield, Mass.

PLATED CUTTING TOOLS

Sir:

We read your article on "Chrome Plating Tools" in the Dec. 10 issue, with a great deal of interest. We appreciate that your magazine is an accepted authority for engineering accomplishments, and feel that you are to be complimented for your valuable contribution to our war program for presenting this article so concisely and clearly.

Engineers of several local concerns manufacturing war materials have consulted with us concerning the Crowell-Collier method of hard chrome plating production tools. Other engineers have called to bring your article to our attention. With such an appreciative response already evidenced, we believe a more complete coverage would benefit our war program.

We would consider it a privilege if we could distribute several reprints of your article to engineers of companies working on war contracts.

ALFRED E. BALLIN,
District Manager
War Production Board,
602 Petroleum Bldg.,
Tulsa, Okla.

• **Several more clippings have been sent you.—Ed.**

Sir:

We would like to know the procedure of Free License for the process of doing hard chromium plating on high speed production tools. (See the article on this subject in your Dec. 10 issue.)

P. M. PATTERSON
Remington Arms Co., Inc.,
Denver, Colo.

• **We suggest that you communicate with C. M. Norsworthy, Crowell-Collier Publishing Co., 250 Park Ave., New York City, in whose plant the process was developed.—Ed.**

BERYLLIUM

Sir:

Was there an article published in your magazine this summer concerning Beryllium obtained from the emerald mines of Colombia, South America? I understand that such an article appeared in one of the trade magazines, and I thought that it might very likely have been in THE IRON AGE.

MARGUERITE G. HAVILAND
1901 Grand Bldg.,
Pittsburgh, Pa.

• **Not in THE IRON AGE.—Ed.**

PLATING ON NON-METALS

Sir:

In the December 31 issue, you refer to a booklet on plating of metals on non-metallic surfaces. We are particularly interested in the possibility of plating on carbon and graphite material. Any data you may be able to supply on the subject will be appreciated.

W. F. SHURTS,
Acting Chief Engr.
Twin Disc Clutch Co.,
Rockford, Ill.

• **The two-part series by Adolph Bregman, "How To Plate Metals on Non Metals" appeared in the June 12 and June 19, 1942 issues. The series is a chapter in the 235-page cloth-bound book, "Cleaning and Finishing Metal Products," published by THE IRON AGE.—Ed.**

BACK PAT

Sir:

We here at the plant think your issue of the 7th was the best yet, and I personally think your article on aircraft production rates among the best.

C. C. HAMILTON
Porter Steel Specialties,
Shelbyville, Indiana

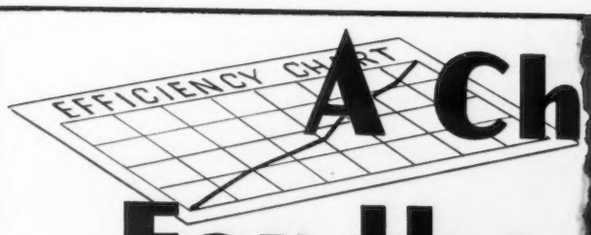
SWAGING HARROW TEETH

Sir:

We are very desirous of locating a swaging machine that will point 9/16 inch square .70 carbon steel. The harrow teeth must be maintained square in the shank.

JAMES H. GREGG
Gregg Mfg. Co., Ltd.,
Winnipeg, Canada.

• **Swaging machine manufacturers are Torrington Co., Torrington, Conn., Etna Machine Co., Toledo, and Langelier Mfg. Co., Providence, R. I.—Ed.**



A Change For the Better

by Wheelabrating

THE Airless WHEELABRATOR —a quick-working remedy for cleaning room headaches—is recommended by hundreds of "patients" who previously suffered from rheumatic production and anemic profits. The prescription is old enough to have survived the acid test of time—and its widespread use is definite proof of its curative powers.

A 24 HOUR JOB CUT TO 7 HOURS

"We wish to say that the addition of this equipment to our cleaning machinery has been a step in the right direction. Prior to the installation of the Wheelabrator, we had been operating nine tumbling churns and one sand blasting cabinet. These, we were obliged to run continuously 24 hours a day and then we were never caught up in our cleaning. Frequently, we had very unsatisfactory conditions arising because of not being able to clean up each day's castings before the succeeding day's output was added to the stock of uncleaned castings. We are now able to have an entire day's production of castings cleaned within about seven hours.

"Our electric bills have been cut almost into half and we feel that this saving alone, in addition to reduction of manual labor costs, will make the Wheelabrator pay for itself within a comparatively short time."

Birdsboro Casting Co., Inc.

CLEANING PRODUCTION INCREASED 40%

"We replaced eight large mills with one Wheelabrator and put through larger tonnages by about 40% than we had ever put through our Mill Room before—and did it easily, which we know could not have been possibly done working overtime with tumbling mills.

"Another plus which we have found since operating it is the fact that we get a much better finish and a much nicer looking casting—any surface defects which might be overlooked in a tumbled casting are brought right out so there is no possibility of getting such casting into the customer's hands or into your own works where there might be a possibility of adding expense to the already defective piece."

Red Jacket Mfg. Co.

NO MORE CASTING "PILE-UPS"

"The Wheelabrator which we purchased from you several years ago has been in constant use since its installation. For the first year it was operated day and night with very satisfactory results. Our cleaning department was crowded for lack of space but after the installation of this machine, we were able to take care of a considerable larger tonnage with less space. We like the increased speed of flow through our cleaning department—no more piling up of castings, using up a lot of valuable space."

Universal Foundry Co.

TRADE MARK
THE AMERICAN HOLDER
REG. U. S. PAT. OFF.

AMERICAN FOUNDRY EQUIPMENT CO.

Blast Cleaning and Dust Control Engineers

510 SOUTH BYRKIT STREET • MISHAWAKA, INDIANA

This Industrial Week . . .

- ***Shortage Emphasis Turns to Components***
- ***Plate Mill Directives Seen Rising***
- ***German Steel Output Reported Down***
- ***Tin Plate Quotas Trimmed Again***
- ***Steel Ingot Output Off Half Point***

WHILE Washington officials this week were slashing the unusually heavy requests for steel, aluminum and copper which Claimant Agencies under CMP have placed for second quarter delivery, the concern of war leaders appeared to be shifting from raw materials to components.

It has been no secret that large quantities of partially completed war machines stood idle over the nation, and that some vital construction programs were unable to proceed because they lacked small equipment. Months ago the complete scheduling of components was advocated but never adopted. Now, with key officials seriously disturbed over the situation, closer attention to production of parts may be expected.

Particularly in the shipbuilding industry it is important that perfect coordination be achieved since keeping ahead of submarine warfare undoubtedly is the No. 1 problem of the nation.

New shipyards, although they won't be launching ships right away, will soon need to place large orders for steel plates. Demand is so heavy that production may reach 1,200,000 tons in March. February directives to the mills for plates also will be unusually high for that month.

At present, shipyards have a large tonnage of plates in stock but only equipment to two months' supply when compared to the present rate of fabrication. This is ample for the entire shipbuilding industry and close to the allowable maximum but several yards have pointed out that in their own individual cases, plate receipts are declining in comparison to their rising rate of launchings. Although direct Navy needs are down currently, around 20 million deadweight tons of shipping will be constructed this year.

News Highlights in This Issue

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GERMANY'S steel production, consisting mostly of carbon steel for which the Nazis have abundant material, is believed to be tapering because of raw material transportation problems, manpower shortages and strikes, slowdowns and sabotage in German-controlled countries. The Allied victories in North Africa were a blow to Axis steelmakers as annual output of high grade iron ore in French North Africa alone is over 3,000,000 tons annually. Zinc and lead, manganese, cobalt and phosphate rock are among the other raw materials now available to the United Nations from North Africa and lost to the Axis.

Lend-Lease Enjoyed Big Year

• • • One out of every three combat planes and tanks built in the United States last year went to our allies, either through Lend-Lease or direct purchases, according to the report of Lend-Lease Administrator Edward R. Stettinius, Jr., announced Monday.

The cumulative value of lend-lease up to Jan. 1, 1943, was $8,253,000,000, including about $1 billion of foodstuffs. Lend-lease in 1942 amounted to $7 billion. Exports of munitions on lend-lease were 15 per cent of American production.

In general, difficulties in the United States are of lesser import for producers. The fuel oil shortage in New England has threatened several very vital plants but up to this writing had not actually curtailed these establishments. In several other areas, natural gas shortages due to cold weather have been temporary barriers threatening production.

All the warring nations are transforming numerous alloy steel parts into carbon steel, but captured German equipment is understood to indicate that the Nazis are making substitutions at a faster rate than other countries. Some of our own equipment which once used tungsten and then molybdenum is slated to go to carbon steel.

Requirements for alloy steel are so heavy that U. S. producers are falling farther behind in delivery promises, already well extended. The situation reflects the lack of slow cooling space, soaking pit capacity and

blooming mill flexibility. Strong efforts are being made to concentrate hot topped alloy steel production at those plants capable of the greatest hot topping facilities. Making the alloy steel situation tighter is the substantial growth in demand for high quality carbon steels which must be hot topped and receive further preferential treatment.

FOR the fourth time in recent weeks, the first quarter tin plate quota has been changed. Initially, the quota was around 750,000 tons but the latest figure is about 620,000 tons. Regardless of who was at fault in the lack of coordination at Washington and the failure to achieve a realistic program, the fact remains that tin plate mills are fearful of losing some of their skilled men during March. At the same time, tin plate requirements in second quarter will be exceptionally heavy in view of slash in the first quarter tonnage.

Because of seasonal conditions influencing the canning industry, tin plate mills normally operate at a high level in first quarter in order to meet demand in second quarter which far outstrips second quarter production of tin plate. So far this year, most mills have been operating at 60 to 70 per cent and will probably continue at about the same level in February with perhaps a drop to 50 per cent later owing to the downward revision in the first quarter quota. Producers fear the lure of higher paid war jobs elsewhere might take some tin workers away.

Last week's allocation of bessemer steel to farm equipment makers aroused much interest, since it confirmed previous predictions that wider use would be made of this type of steel. The main question, however, is not one of bessemer vs. open hearth steel, but one of utilizing the greatest amount of steel that can be made. Whether bessemer facilities are used for ingots, scrap, hot metal for open hearths or for semi-duplexing is immaterial.

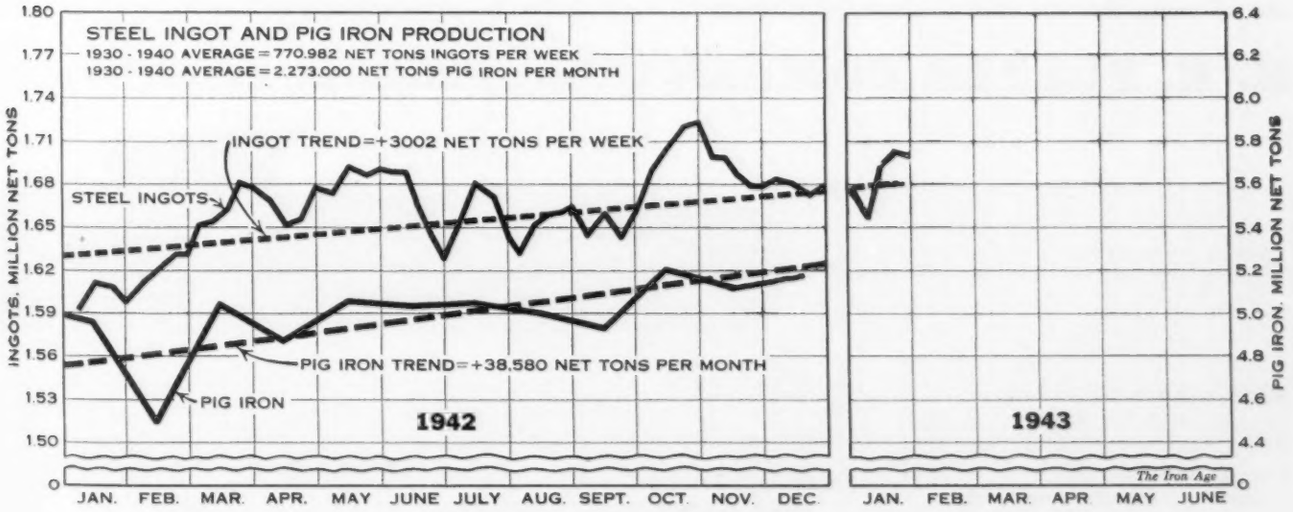
The interest of most metal users and producers continues to center around the Controlled Materials Plan. It appears now that the Class B list will be undergoing constant revision downward, because of the necessity for eliminating items. WPB officials are beginning to admit that the plan will increase the burden of paper work, but they justify it by calling it "purposeful paper work." Three additional regulations under CMP have been drawn and their issuance is believed to be merely a matter of a short time.

63,009 New Freight Cars and 712 Locomotives Put On In '42

• • • Class I railroads put 63,009 new freight cars and 712 new locomotives in service in 1942, the Association of American Railroads, New York, announced. This was the smallest number of new cars to be installed since 1939 but the greatest number of locomotives since 1930. In 1941 the railroads put 80,502 new freight cars and 633 new locomotives in service.

Of the new freight cars installed in the past calendar year, there were 34,713 box and 23,144 coal cars. The new locomotives installed in 1942 included 308 steam and 404 electric and diesel compared with 161 steam and 472 electric and diesel in 1941. Class I railroads on Jan. 1, 1943, had 27,061 new freight cars on order, compared with 74,897 cars on the same date one year ago.

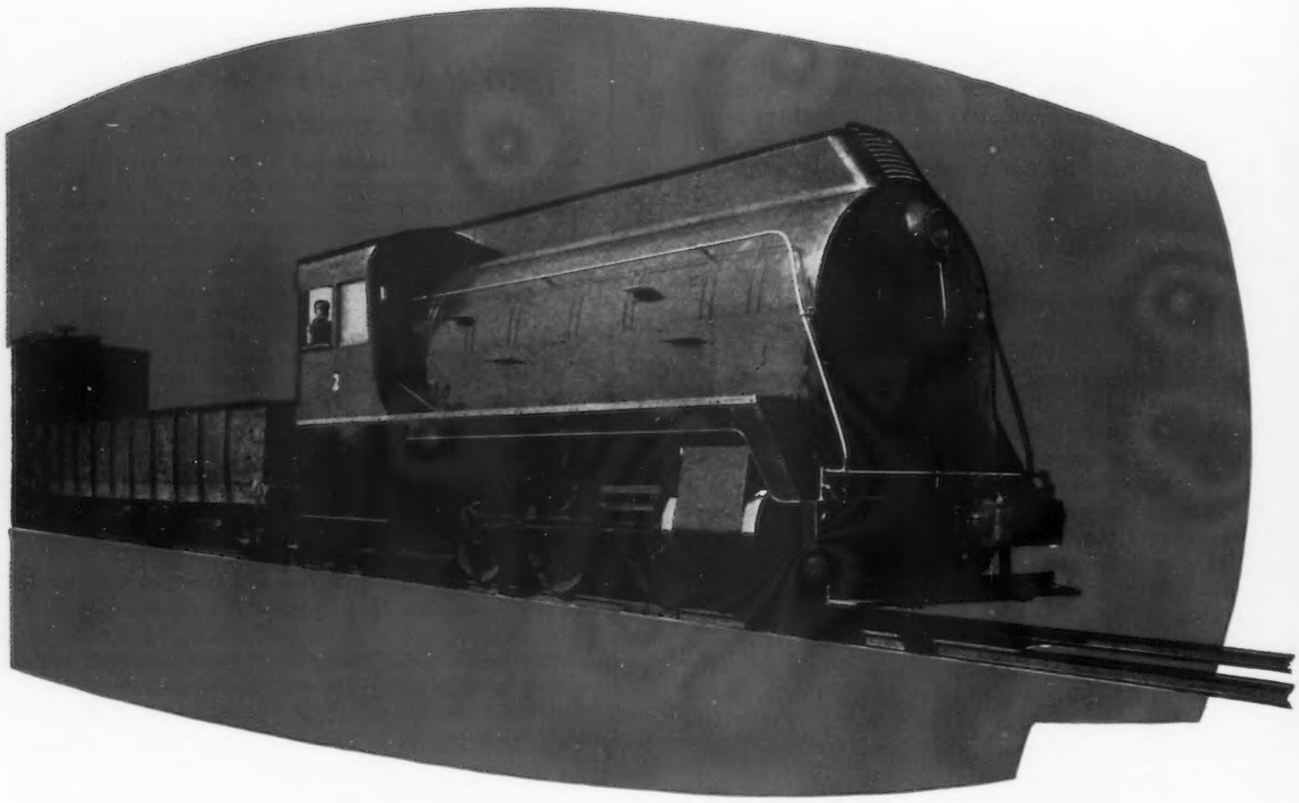
U. S. STEEL ingot production fell back this week to 99.5 per cent of capacity, compared with last week's output of 100 per cent. Pittsburgh schedules dropped half a point to 99.5 per cent and in Chicago operations decreased one and a half points to 100.5 per cent. Steelmaking in Cincinnati dropped off seven points to 105 per cent while in St. Louis it sagged one and a half points to 105 per cent. Detroit operations gained one and a half points to 103.5 per cent and in the Eastern District the melting rate reached 103 per cent, up nine points from last week. Continuing at unchanged schedules are Youngstown at 101 per cent, Philadelphia at 92 per cent and Cleveland at 95. Also working at last week's rates are Wheeling at 90 per cent, Buffalo at 106.5 per cent and Birmingham at 102 per cent.


STEEL INGOT AND PIG IRON PRODUCTION
1930 - 1940 AVERAGE = 770,982 NET TONS INGOTS PER WEEK
1930 - 1940 AVERAGE = 2,273,000 NET TONS PIG IRON PER MONTH
INGOT TREND = +3002 NET TONS PER WEEK
STEEL INGOTS
PIG IRON TREND = +38,580 NET TONS PER MONTH
PIG IRON
INGOTS, MILLION NET TONS
PIG IRON, MILLION NET TONS
1942
1943
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
JAN. FEB. MAR. APR. MAY JUNE
The Iron Age

Steel Ingot Production by Districts Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	S.Ohio River	West	St. Louis	East	Aggregate
January 21	100.0	102.5	101.0	92.0	95.0	106.5*	90.0	102.0	102.0	112.0	102.0	106.5	94.0	100.0
January 28	95.5	100.5	101.0	92.0	95.0	106.5	90.0	102.0	103.5	105.0	102.0	105.0	103.0	99.5

* Revised



New, Unskilled Labor can quickly learn to operate and service PORTER Fireless Locomotives

Porter Fireless Steam Locomotives offer an ideal solution to a serious labor problem: Because there are no complex mechanisms or controls, a relatively unskilled man can operate and service one with only a few hours' training. Porter Fireless Locomotives are so ruggedly and simply constructed there is little danger of damage by inexperienced operators.

If steam at 85 pounds pressure is available in your plant, a Porter Fireless can save you up to 50% in haulage and switching costs. Produced in direct or geared-drive types, in sizes from 10 to 100 tons. Write for complete information.

H. K. PORTER COMPANY, Inc. Pittsburgh, Pennsylvania

ESTABLISHED 1866

ONLY PORTER BUILDS A COMPLETE LINE OF LOCOMOTIVES FOR INDUSTRY

ARMY E NAVY

PORTER Better Built Locomotives

DEPENDABLE DELIVERY

Since no critical materials such as diesel engines, electric motors, etc., are used, you can count on delivery of a Porter Fireless at the time promised.

LOW INITIAL COST

Because of the simplicity of its design and operating mechanisms, the Porter Fireless can be produced at a low cost. There is nothing to make the initial cost high. A Porter Fireless costs you less than most other types of comparable weight and power.

LOW OPERATING AND MAINTENANCE COSTS

A Porter Fireless uses low-cost steam produced anywhere in your plant. Charging can be done once or twice a day during idle periods. No night or week-end attention is required. Fewer working parts mean fewer repairs. There is no boiler or firebox, diesel engine or electric motor—the reservoir never needs replacement.

LONG LIFE

The first Porter Fireless was placed in service 29 years ago and is still in service.

SAFETY

There is no fire hazard with a Fireless. It is explosion proof since excessive pressures are not possible.

Navy Saves $717,000,000 Through Renegotiation of Contracts; Army Asks for Higher Exemption Limit

Washington

• • • **The Truman** Senate Committee announced last Thursday the results of two days of hearings held on the subject of renegotiation of contracts through the issuance of statements made by representatives of the Army, Navy and Maritime Commission. Undersecretary of the Navy James Forrestal said that the Navy had saved $717,000,000; Lt. Com. Arthur G. Rydstrom, member of the Maritime Commission Price Adjustment Board, said the board's renegotiation efforts amounted to $32,000,000 saved. Undersecretary of War Robert P. Patterson discussed the scope of the renegotiation statute and its effect on legal and accounting aspects of the War Department's contracting.

Forrestal disclosed that in eight and one-half months ended Jan. 18, the Navy's Price Adjustment Board started renegotiation proceedings with 1484 of its contractors. He pointed out that $198,000,000 of the total saved would be refunded, with downward revision of contract prices accounted for the rest—some $518,000,000.

Ascribed as reasons for renegotiation was the fact that the war brought an unprecedented expansion in the volume of business and no one could forecast at the time contracts were signed what reductions in prices might grow out of industrial operations of the magnitude required by the war.

Also supporting the need for review of contracts was the reason that many manufacturers were asked to undertake operations with which they were wholly unfamiliar. New industrial processes undreamed of when the contract was signed were developed after production started. These manufacturers did not have peacetime experience on which to base estimates.

The Navy found that because no one could evaluate all factors some prices were too high and some too low.

The following examples of the Price Adjustment Board's effort were cited:

The estimated unit cost for 5-in. 38 caliber guns was put at $70,000 by the Navy gun factory when it was making three or four a month. The first commercial contracts were let at prices just under the Navy estimate. However, the Navy was able to place a contract for 200 mounts with one contractor at a unit price of $40,000.

An automotive company agreed early in 1941 to make a new type of anti-aircraft gun at $7000 a gun. The price now is down to $5,136, a drop of 26 per cent. Because production increased 500 per cent, design and production methods improved with workmen becoming adept at their jobs the price reduction was possible.

An aircraft manufacturer's 1943 sales would have amounted to nearly $500,000,000 if contract revision had not squeezed out $100,000,000 worth of inevitably inaccurate cost estimates. The plant's expansion from an annual dollar output of $3,600,000 to its present size plus such factors as a reduction in man hours from 110,000 to 26,000 in the building of B-17 bombers accounts for the price slice.

In 1941 another aircraft company signed an $8,200,000 Navy aircraft contract. At that time it was a small company. A small miscalculation of costs, Mr. For-

o o o

LANDING SHIP EMBARKS: With its internal combustion motors roaring and its paint dry enough for the trip to the seaboard, the first of a large number of new type landing ships from the Navy shipyard at Ambridge, Pa., operated by American Bridge Co., hit the water Jan. 23.

restal said, would have wiped out the company's capital.

Therefore, this company was unwilling to take the order except at a price which covered all contingencies. As the company got into production, it cut its costs and the "contingencies did not materialize."

"The contract is now completed at a profit which the company agrees is excessive. This company will refund more than $8,250,000 on this and other contracts," Mr. Forrestal said.

In renegotiating contracts, Mr. Forrestal said, the Navy has pledged itself to four principles. As stated, they are:

"Profits shall be held as Congress intended to level's which are reasonable in the light of the sacrifices which the war demands of the whole nation. Some men shall not profit excessively while their fellow men die in the Southwest Pacific and North Africa.

"Renegotiation shall be exercised within the limits of reason. It shall not be a punitive weapon.

"Renegotiation shall encourage efficient production. It shall not influence manufacturers toward a cost-plus basis of contracting.

"Renegotiation shall be a bilateral process, offering manufacturers ample opportunity to present their case."

Mr. Forrestal said that some people had expressed apprehension about renegotiation. He said it reminded him of a sign which used to hang in a doctor's office: "I am an old man and have had many troubles—but most of them never happened." The Undersecretary averred that as renegotiation proceeds, the conviction of its fairness will spread.

Commander Rydstrom for the Maritime Commission presented for the confidential use of the committee a record in detail showing the exact results of operations to Jan. 18. He likewise gave the committee a record of Maritime's renegotiations.

"It is in the field of machinery and equipment that the operations of the Price Adjustment Board can be put to best advantage for the Commission's practice in the case of the major portion of ship construction is to purchase the equipment for its own account and to allocate to the particular yards," he said.

Speaking for the War Department, Mr. Patterson said that only 9000 companies have been assigned for renegotiation out of 80,000 companies holding 3,000,000 prime contracts. Of these, he pointed out that only 4000 companies have had their contracts subjected to the processes. Also he reiterated a recommendation that subcontracts for raw materials, standard commercial fabricated or semi-fabricated articles ordinarily sold for civilian use, or articles for the general operation or maintenance of the contractor's plant be exempted from renegotiation.

Bolstering his argument for elimination of standard commercial articles from renegotiation, Mr. Patterson said:

"One of the most time-consuming features of renegotiation is the accounting difficulty of segregating sales of standard commercial articles between those sold for use in war production and those sold for civilian use. It is difficult to trace these articles."

Mr. Patterson said that he thought an increase in the present so-called exemption from $100,000 to $500,000 or even more would eliminate an additional group of small companies without substantially impairing the benefits of renegotiation. The present law is that contracts under $100,000 are not subject to renegotiation.

Work Week over 48 Hr., Machine Tools Leading

• • • An increase of 0.7 per cent in average weekly hours worked in war industries brought the scheduled work week over the 48-hour mark in November. The gain was made even though 18 of the 49 durable-goods industries reported fewer hours worked.

Five groups reported 49 or more hours worked per week, namely machine tools (52.8) aero-engines (51.2), engines except aircraft (49.5), firearms (49.2), and machinery and machine-shop products (49.0).

Average hourly earnings were 100.3 cents for the durable-goods wage earners, 76.3 cents for the non-durable goods workers, and 89.9 cents for both groups combined.

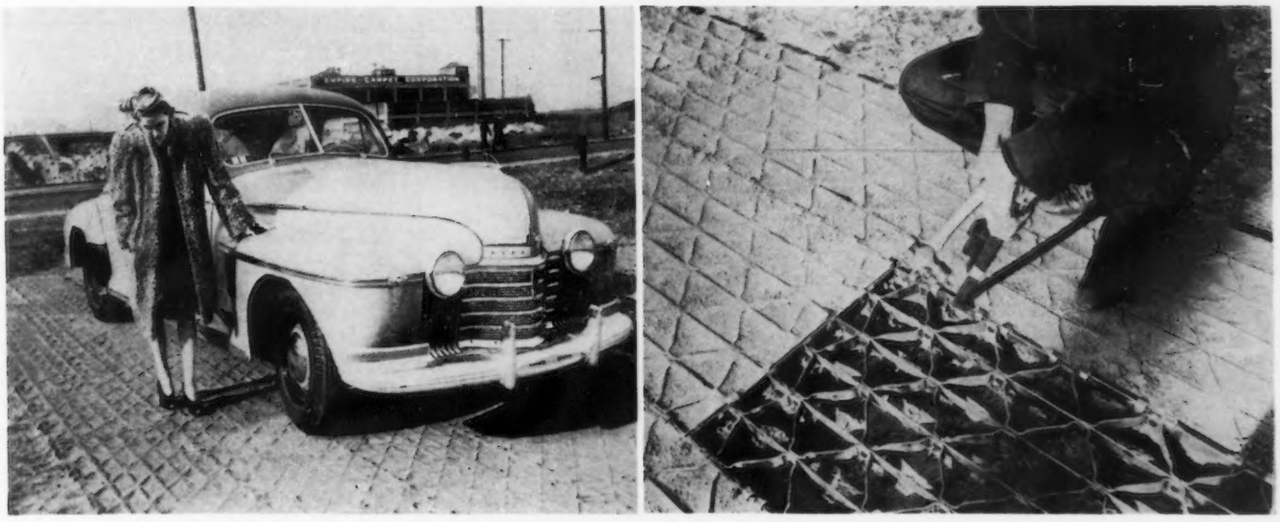
TWO-WAY PULL: This is the American built counter-rotating, constant speed propeller test flown at East Hartford, as described in last week's issue. Two three-bladed propellers are mounted one behind the other on co-axial shafts and driven by one engine. It gives increased blade area, removes torque reaction, and a certain amount of rotational energy in the slip stream of the front propeller is recovered and put to work by the second.

Press Association, Inc.

Canadian Strikes Bring Flood of New Orders to Mills

Toronto

• • • With possibilities of a serious shortage of steel and pig iron as the result of strikes, a flood of new orders has poured into the market during the past two weeks, mostly from purchasing agents of war plants, many of which already were beginning to run short of urgently needed steel. Orders were of a diversified nature, and the chief call was placed on companies that remained in production.



Acme

ROADWAY OF THE FUTURE: Here's the old dirt road of the past, with modern variations. Virginia Stanton examines completed section of the new type surfacing on Long Island City proving grounds. On the right is a close-up of how the roadway of the future may be laid quickly, economically and efficiently to aid in the building up of post-war communications and international highways. A workman on the grounds of the Irving Subway Grating Co. attaches steel grating panels, similar to those in use in the war arenas by our air forces as portable emergency landing fields. The panels can be attached with a simple pronged tool. Sand is then filled between meshes and oil sprinkled on the surface as binder.

Russia Gets Most of Lend-Lease Tanks

Washington

• • • **In a statement** last week on lend-lease aid to the Soviet Union, Edward R. Stettinius, Jr., lend-lease administrator, said up to Jan. 1, 1943, the United States shipped more than 3200 tanks. This, he said, is more than have been sent from the United States under lend-lease to any other country since the beginning of the lend-lease program in March, 1941, although the lend-lease aid to Russia did not begin until October, 1941.

Lend-lease shipments of war supplies to the Soviet Union last November reached a new high and were 13 times the total sent in January, 1942. Two-thirds of the value of November shipments were accounted for by military items. The remainder were industrial materials for Soviet munitions factories and food for the Soviet army.

"We have sent to the Soviet Union under lend-lease almost 2600 planes," said Mr. Stettinius. "This is more than we have shipped to the United Kingdom or to any other military theatre under lend-lease. We have sent 81,000 trucks and jeeps and other military motor vehicles to the U. S. S. R.

"The United Kingdom has also supplied the Soviet Union with quantities of military equipment produced in Great Britain. The United Kingdom has shipped to Russia more than 2600 tanks and more than 2000 planes. These arms are being supplied to Russia by the United Kingdom on a lend-lease basis."

Army-Navy Committee On Specifications Formed

Washington

• • • **The War and Navy** Departments have set up a Joint Army-Navy Committee on Specifications. The duty of the committee will be to standardize war materials used by the two services and thereby increase the flow of war materials from United States factories by reducing all unnecessarily different specifications and requirements. The new joint specifications will be designated "JAN." The committee also will arrange joint Army-Navy standards for capacity, performance and dimensions, as well as specifications.

Cooperation between the two services already has standardized many items from clothing to arms. Within the Navy Department, the Navy Specifications Board and the War Department Standards and Specifications Section of Services of Supply have been operating for some time.

Machinery Problems in Plastics Field Studied

Washington

• • • **The critical situation** facing the thermoplastics industry in regard to machinery was discussed by the WPB Thermoplastic Processors Industry Advisory Committee at a meeting in Washington last week. Members of the industry were advised of the number of requests being received for extrusion and injection molding equipment by government officials, and that in a large number of cases priorities for new machines could not be recommended because there is available equipment not now engaged in war production.

Committee members agreed with the WPB Chemicals Division that while individual processors are heavily loaded with war work, a majority of the companies in the industry are still engaged largely, or exclusively, in civilian production. Furthermore, some of their equipment is running only part time. A possible means of directing available facilities to war production would be through more rigid controls on plastic raw materials, including scrap, members suggested. Another suggestion was a limited rental price for injection and extrusion machines.

Nine New Electrolytic Units Will Be Making Tinplate Soon

Pittsburgh

• • • **Lack of fusion** equipment for melted finished plate has held up the completion of many electrolytic tinplate lines but nine units, in addition to the four which were already operating, will be making commercial tinplate sometime in the first quarter of this year.

Many units already are capable of producing tinplate with a matte or brushed finish and it is said that this type of plate is satisfactory for some closure uses.

Sometime during the second, third and fourth quarters the balance of the electrolytic lines, numbering 15 units, will be commercially operating. The completion of all projects will mean that the country will have 28 units capable of producing from 40 to 45 million base boxes of electrolytic tinplate.

Due to the hold up in deliveries of fusion equipment, it is estimated that about 23 million base boxes of electrolytic tinplate will be made this year or roughly about 40 per cent of the total tinplate to be produced. According to reliable estimates it is believed that electrolytic tinplate production by quarters will be somewhat as follows: First quarter, 1,800,000 base boxes; second quarter, 4,600,000 base boxes; third quarter, 7,600,000 base boxes; and fourth quarter, 9,000,000 base boxes. Production difficulties may increase or decrease these estimates but not to any great extent.

Meanwhile the tinplate order situation has been showing improvement. A few weeks ago orders from can makers were slow in coming through. Considerable activity is expected for the remainder of this quarter and all of the second quarter when there will be heavy demand. Delay in getting realistic can requirements is said to have been responsible for some of the early confusion and changing of quarterly tinplate requirements. Most tinplate mills will be operating around 60 per cent of capacity this quarter and may expand to 70 per cent or more in the second quarter.

Electrolytic lines already in commercial operation at the beginning of the year were Carnegie-Illinois with one at Gary and one at Irvin works, Crucible Steel Co. of America and Crown Cork and Seal. All steel companies but one with projects underway will be in commercial operation with at least one electrolytic line during the first quarter of this year—that is fusion equipment will have been installed before March 31 on at least one unit in each company.

Assault Corps Developed to Tackle Problems of Small Firms

Cleveland

• • • **The ever-increasing** need for immediate and expert engineering aid to many smaller manufacturers producing critical war products has resulted in the development of the Production Engineering Service, a WPB service that is being tried out for the first time in Northern Ohio.

In three months, PES has been called in on some 720 cases and has worked out solutions to production problems for almost 50 per cent of this number. Practically all of the remaining cases were classified as sufficiently important to the armed services to demand immediate aid.

On any task on which the armed services ask for help, it is the aim of PES to put the finger on the difficulty and outline a program of action within 48 hours. If a manufacturer asks for help, various agencies are first consulted by PES to determine the urgency of the manufacturer's product.

When a problem is presented, it may be handled by any of 15 highly trained engineers on the PES staff. Frequently it falls under other WPB branches and if so specialists from such sections are immediately called in, often working out the problem on the spot.

Among the WPB services available to the Production Engineering Service in working out problems are:

(1) Materials Redistribution, a service that lists materials from idle, frozen, or cancelled stocks, and can frequently tide over a gap in manufacturers stocks; (2) Idle Machine Tool Facilities, which weekly lists open time on machine tools that can be obtained by manufacturers; (3) Priorities Service, whose trained personnel is called upon to aid on any problems involving priorities; (4) Used Machine Tools Division, where machine tools and other industrial equipment for sale are listed, permitting many production bottlenecks to be broken; (5) Labor Service, a service available for consultation on labor problems; (6) Labor Morale, a branch of WPB that plans and assists in the organization of labor-management committees to solidify factory relationships; (7) Idle Plant Facilities, where up-to-date records of partially or totally idle plants available for lease or sale are kept; (8) New Machine Tools Division, a consulting and expediting service that deals only with new machine tools on order; (9) Expediting Service, a unit that speeds delivery of materials on order where the urgency is great and factory organization is unable to obtain necessary results; (10) The Manpower Division, a service aiding on such problems as training, equipment, female and Negro help, upgrading, and Selective Service Manning Tables.

In addition, the PES corps of engineers is available to plan and schedule production if the manufacturer so desires. Often it has been found that solutions to problems can be applied immediately, but in cases where it takes longer the PES engineer stays on the job to get the critical parts on their way in the shortest time possible. The success of the service is measured, not in dollar volume of products speeded to the war fronts, but only on the extreme urgency of the items expedited. Although the many specialized services of the WPB branches have been available to manufacturers, PES brings them all into coordinated action when necessary.

Some tasks undertaken by the Production Engineering Service during the short time of its existence are typical of its work. One Ohio firm was falling behind on production of a part for the Army Air Forces, and, when called upon, placed the blame on a supplier of small castings. It was discovered upon investigation of the foundry supplying the castings, which was in another part of the state, that the patterns supplied by the prime producer were faulty in design and rejects were running very high. The prime contractor was told to redesign the pattern, which was done, and now the foundry is

keeping up with an increased production schedule and rejects have fallen off to practically nothing.

A bearing manufacturer had difficulty in having bearing castings made, so PES had seamless tubing shipped into the plant and developed a method for making the bearings from the tubing. Meanwhile, the purchaser of the bearings was supplied with 41 sets from other sources, thus enabling production schedules to be maintained until bearings made from the tubing were forthcoming.

Another emergency was met by a PES engineer who discovered that shell production was being delayed by a state law forbidding the use of certain equipment. This emergency was ended within 48 hours because PES was able to get a change made in the law.

Andrews Expansion Among Many New Projects Approved

Washington

• • • **Defense Plant Corp.,** RFC subsidiary, has authorized the following contracts:

The Andrews Steel Defense Corp., Newport, Ky., to provide additional plant facilities in Kentucky at a cost in excess of $1,000,000, making a total commitment of more than $5,000,000.

Publicker Commercial Alcohol Co., Philadelphia, for further expansion of a plant in Pennsylvania at a cost in excess of $2,000,000, making a total commitment of more than $4,500,000.

General Motors Corp., Detroit, for a plant and equipment in Indiana at a cost in excess of $4,000,000.

National Distillers Products Corp., for the construction and equipment of a plant in Missouri at a cost in excess of $2,000,000.

Demuth Glass Works, Inc., Brooklyn, to provide additional plant facilities in West Virginia at a cost in excess of $100,000, making a total commitment of more than $400,000.

Northrop Aircraft, Inc., Hawthorne, Cal., to provide additional facilities at a plant in California at a cost in excess of $100,000, making a total commitment of more than $375,000.

Couse Laboratories, Newark, N. J., to provide additional equipment in a plant in New Jersey at a cost in excess of $350,000.

General Electric Co., Schenectady, N. Y., to provide equipment in a plant in Indiana.

A. O. Smith Corp., Milwaukee, to provide plant facilities in Wisconsin at a cost in excess of $23,000,000.

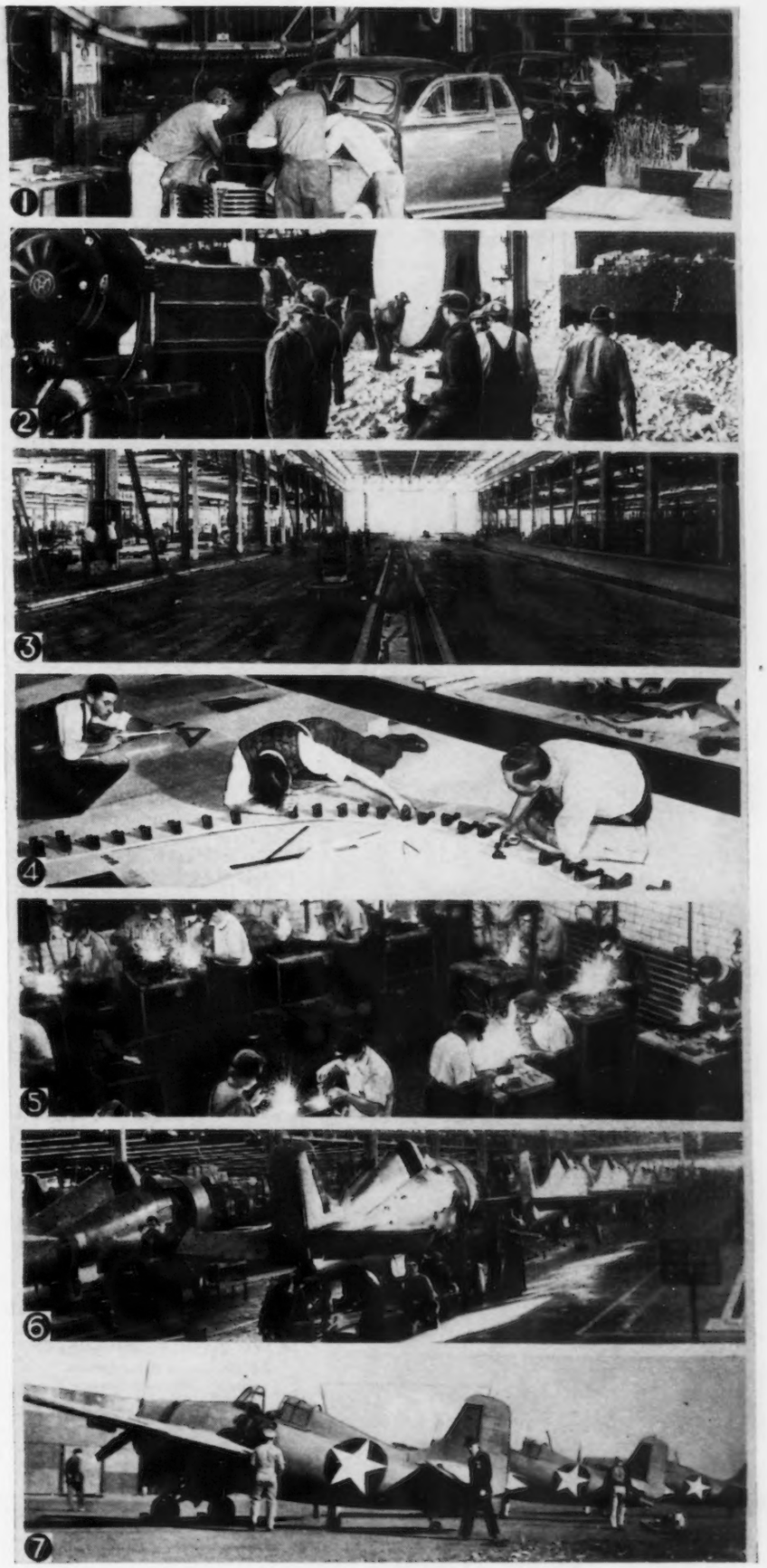
American Bosch Corp., Springfield, Mass., to provide additional equipment for a plant in Massachusetts at a cost in excess of $350,000, making a total commitment of more than $3,000,000.

General Electric Co., Schenectady, N. Y., to provide additional equipment in a plant in New York at a cost in excess of $1,200,000, making a total commitment of more than $2,500,000.

Meisel Press Mfg. Co., Boston, to provide additional plant facilities in Massachusetts at a cost in excess of $750,000, making a total commitment of more than $1,200,000.

Briggs & Stratton Corp., Milwaukee, to provide equipment for a plant in Wisconsin at a cost in excess of $900,000.

Indiana Steel Products Co., Chicago, to provide additional plant facilities at a plant in Indiana at a cost in excess of $250,000, making a total commitment of more than $600,000.



AUTOS TO PLANES: Pictured above are major steps taken at the General Motors Eastern Aircraft plant, Linden, N. J., converted from autos to airplanes. From top to bottom: 1—The old auto assembly line. 2—Demolition. 3—Stripped plant. 4—Planning. 5—Training. 6—New airplane assembly line. 7—Flyaway.

Post-War Market Plans Imperative, NIAA Warned

Chicago

• • • **If the 9,000,000 soldiers** who will return when the war is ended are not to be set into a jobless future, plans must be laid now for the development of post-war markets and products, Bennett Chapple, assistant to the president, American Rolling Mill Co., told members of the National Industrial Advertisers Association at their midwest regional conference here last week.

Post war planning, Mr. Chapple said, is a vital peace objective to aid the returning soldiers. He warned the 500 industrial advertisers attending the conference that advertising men must avoid the pitfall of "too little planning, too late." He added that if private enterprise doesn't meet the post war challenge, the government will.

PICTURED here are some of the many applications to provide heat for industrial buildings and service camp structures where Dravo Heaters were installed and, in many cases, in preference to a central steam heating plant.

Each Dravo direct fired heater is a self-contained unit with its own combustion chamber, motor and fans to circulate the warm air in the space to be heated. One or more of these heaters can be arranged to heat buildings of any shape.

Such a system is quickly installed, furnishes instant heat and represents a substantial saving in manhours and scarce metals over a central steam heating plant and necessary distributing system.

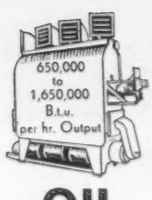
Types for any application—models for all fuels—request Bulletin 505—or consult "Sweets."

DRAVO CORPORATION

Heater Department

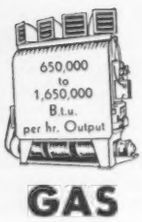
DRAVO BLDG., PITTSBURGH, PA.

Forty-seven Sales Offices in Principal Cities

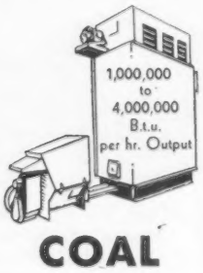


OIL

DRAVO DIRECT FIRED HEATERS



GAS



COAL

Milestones

• • • **The Keystone Bolt & Nut Corp.,** New York City, observed its 20th Anniversary on Dec. 18. President I. J. Feldman, who founded the company, gave official recognition to the event by a dinner for the employees. Each worker buys a War Bond a month, under an incentive plan devised by Mr. Feldman.

Keeney Gets New Post With WPB At Washington

Washington

• • • **Robert M. Keeney,** former chief of the WPB Steel Division's Nickel Section, was appointed last week as deputy director of the General Industrial Equipment Division.

Bernard L. Gladieux has been given supervision of all aspects of budgeting, organization and general administration by Donald Nelson. Dr. E. W. Reid of Pittsburgh, has been appointed deputy director general for industry divisions. Brig. Gen. C. D. Young has been made deputy director of ODT. The newly created power bureau of WPB will be headed by J. A. Krug.

Plastic Hose Nozzles Feature Exhibit in Chicago

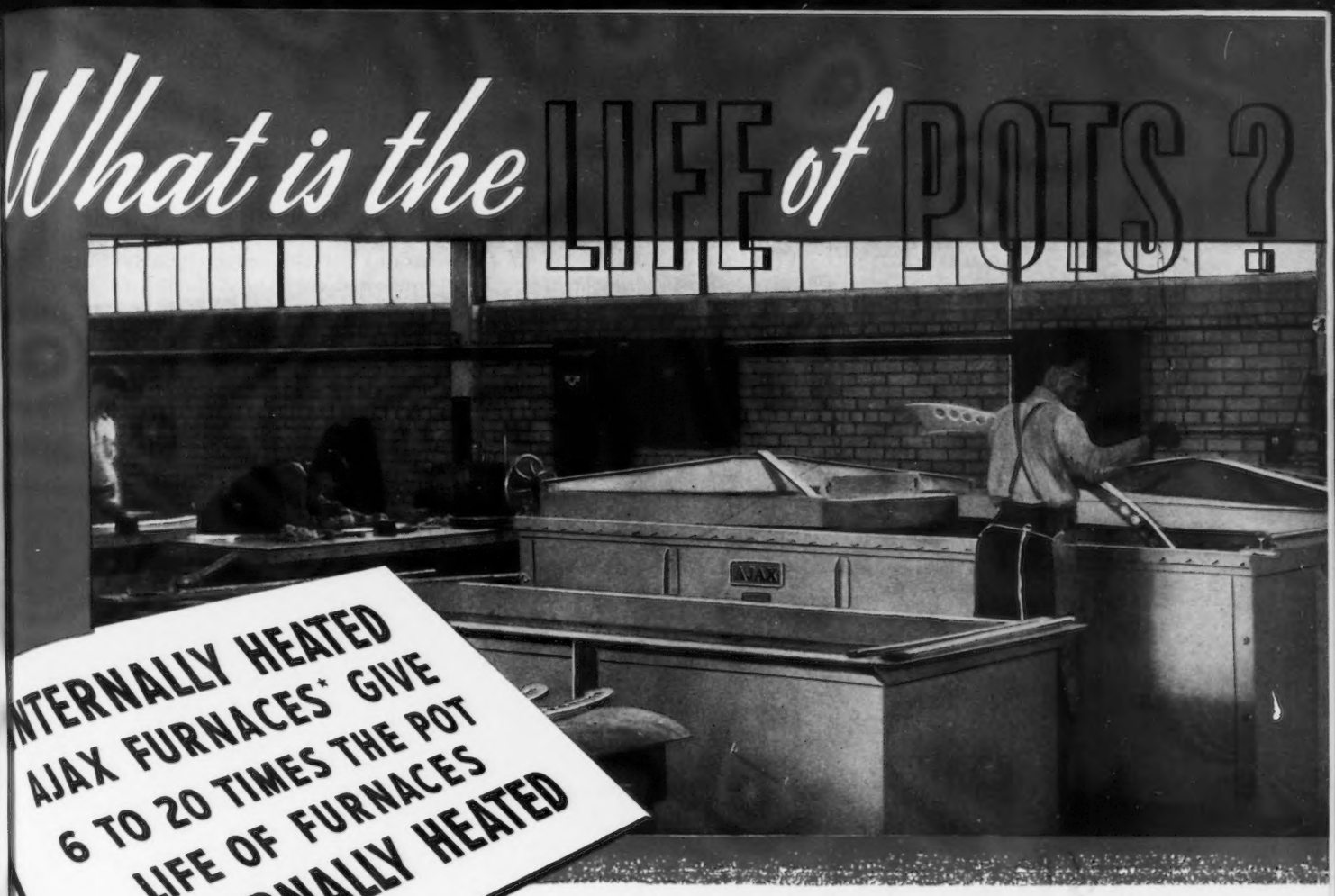
Chicago

• • • **Plastic** hose nozzles and ceramic lawn sprinkler bases were among products displayed at a meeting and exhibit of the Ace Hardware Co. held here last week.

The guarantee of the nozzle is good only for pressures up to 75 lb. and the user is warned not to drop it on the sidewalk. Another substitute, ceramics, were used in a lawn sprinkler. The base of the sprinkler was made of a heavy ceramic material.

One company displayed a new line of plastic pipe fittings to be used with plastic tubing.

What is the LIFE of POTS?



INTERNALLY HEATED AJAX FURNACES* GIVE 6 TO 20 TIMES THE POT LIFE OF FURNACES EXTERNALLY HEATED

POT LIFE

The first Ajax electric salt bath furnace in the U. S. was installed in 1936 for carburizing . . .

Long pot life was predicted even then because of Ajax internal heating and automatic circulation principles. Now the records of over 1,000 different Ajax installations show there is a new standard of pot life, set by these furnaces, for all operations from 350° to 2400° F.

This made it possible for the first time to conveyorize salt bath furnaces. And it is one reason why Ajax furnaces cost less overall to operate than gas or oil fired equipment . . . another reason more Ajax salt bath furnaces are installed than all other electric makes combined.

CARBURIZING: Plain, welded steel plate pots show a service life of 3 years maximum.

HARDENING HIGH SPEED STEEL TOOLS: Ceramic pots—first installed by Ajax for this purpose—deliver pot life up to 3 years.

NEUTRAL HARDENING: Ajax furnaces equipped with ceramic pots show a pot life of 3 years and upward.

AGE HARDENING: (Solution heat treatment of aluminum alloys): Plain steel Ajax pots show no failure after more than 6 years in service.

CYANIDE HARDENING: Plain steel pots show service records similar to carburizing.

ANNEALING: Welded steel plate pots last up to 5 years, depending on bath temperatures.

BRAZING & CARBURIZING SIMULTANEOUSLY: The life of steel pots averages 2 years.

SELECTIVE HEATING: Same length of service as for neutral hardening.

TEMPERING: Plain steel pots last 4 years and upward.

These are service records. Send for the full story. Write for Catalog 107-A.

AJAX ELECTRIC COMPANY, Inc., Frankford Ave. at Delaware Ave., Philadelphia, Pa.

*THERE'S AN AJAX INSTALLATION NEAR YOU!

SELF-HEATING SELF-CIRCULATING

THE AJAX HULTGREN ELECTRIC SALT BATH FURNACE

ASSOCIATE COMPANIES:
AJAX METAL COMPANY, *Non-Ferrous Ingot Metal for Foundry Use*
AJAX ELECTRIC FURNACE CORPORATION, *Ajax-Wyatt Induction Furnaces for Melting*
AJAX ELECTROTHERMIC CORPORATION, *Ajax-Northrup Induction Furnaces for Melting, Heat-Treating*

Bessemer Steel Given Farm Machine Firms

Washington

• • • **The WPB** Requirements Committee last Thursday increased by 50,000 tons the first quarter allotment of Bessemer steel for farm machinery immediately after a Senate committee made public a report sharply criticising WPB for not supplying enough steel to serve agricultural needs.

With the increase, the total Bessemer steel allotted for the first three months of 1943 is 187,000 tons compared with the prior total of 137,000 tons. Top priority of AA-1 was assigned delivery of the steel.

WPB Chairman Donald M. Nelson took issue with the Senate Committee's criticism.

The farm machinery program for second quarter will be acted on at the same time all other programs for the second quarter are reviewed early next month, said a WPB announcement. The tonnage allotted last week is in addition to the increase authorized last week in the program covering production of repair parts for farm machinery. Under the latter increase, repair parts can be produced at a rate of 167 per cent of the 1940 production as requested by the Department of Agriculture.

Anthracite Walkout Ruled Voluntary Suspension of Work

Harrisburg, Pa.

• • • **The unemployment** compensation bureau here last week ruled that the recent wildcat anthracite coal strike was a "voluntary suspension of work in an industrial dispute." Director Frank A. Shallow stated that the "voluntary" walkout invalidated any claims for jobless benefits by the strikers for a three-week disqualification period.

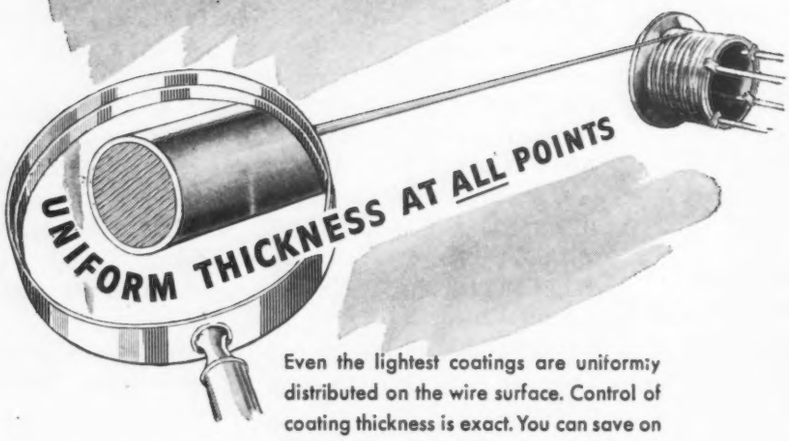
FIRST "SAFETY ACE": Rocky Caruso, war worker at the Walter Kidde Company plant in Belleville, N. J., manufacturers of inflation cylinders for Army and Navy airmen's life rafts, was first in a series of "Safety Aces" to be honored by the War Production Fund to Conserve Manpower, for good work in keeping production lines free of accidents. Rocky invented a device that protects the eyes and muffles noise during testing operations.

ECONOMIZE ON ZINC

with

MEAKER PROCESS

for Electro-Galvanizing Wire



Even the lightest coatings are uniformly distributed on the wire surface. Control of coating thickness is exact. You can save on zinc, produce more perfect coatings, make more profit with Meaker Process for Electro-Galvanizing Wire.

"A proven success by every test"

WE INVITE YOUR INQUIRY

The MEAKER Company

1635 South 55th Avenue, Chicago

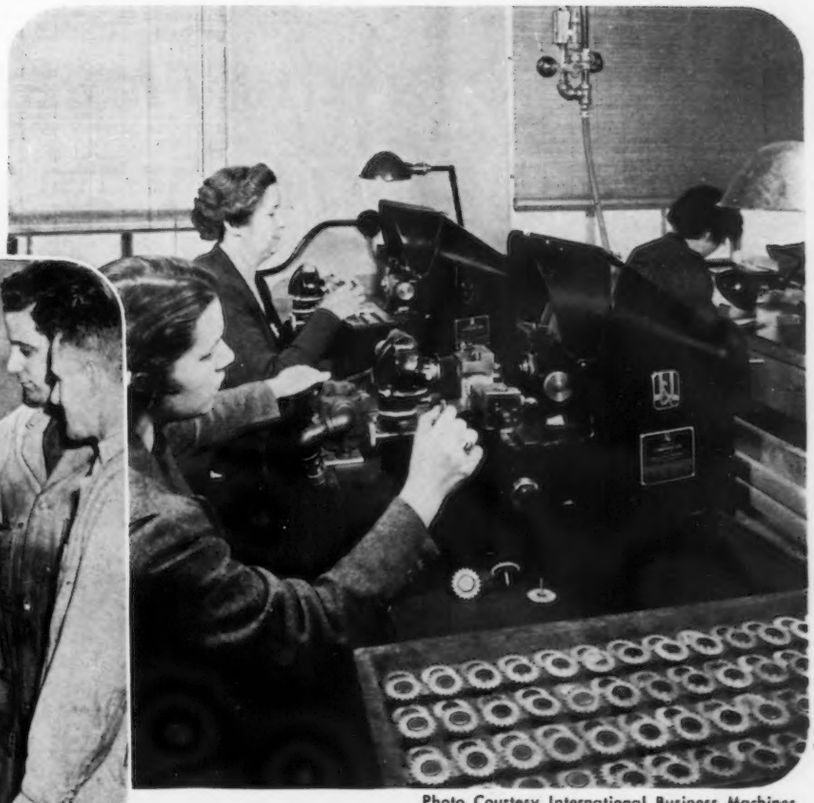
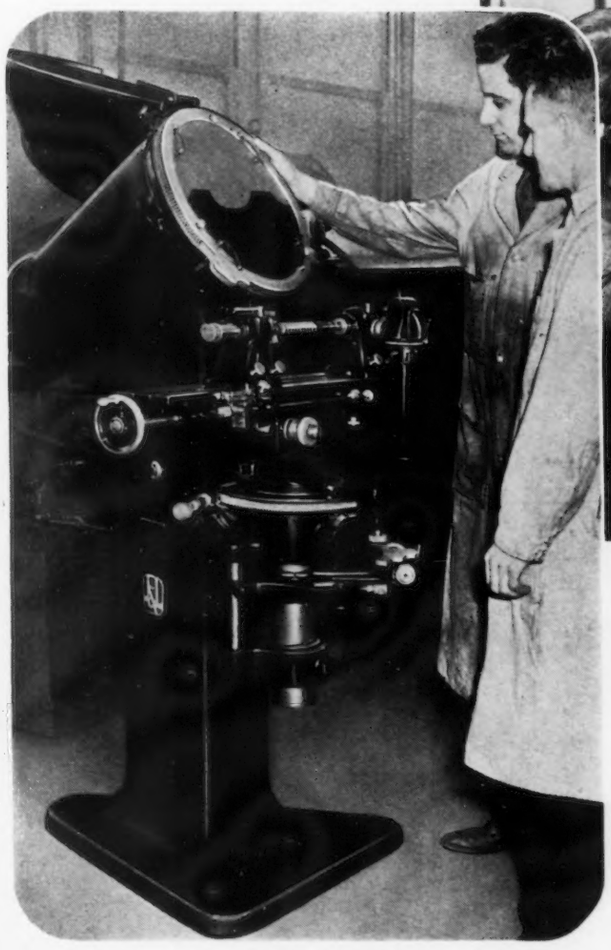


Photo Courtesy International Business Machines



Modern inspection by optical projection saves time and money

Jones & Lamson Comparators are available in Pedestal, Bench and other types to meet every need in the field of Inspection by Optical Projection. We shall be pleased to study your problems and apply to them the accumulated experience of more than twenty years in this field.

Profit-Producing J&L *Machine Tools*

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Ram and Saddle Type Universal Turret Lathes · Fay Automatic Lathes · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers.

Part of the Fleet's Fighting Efficiency . . .

KEYSTONE Wire

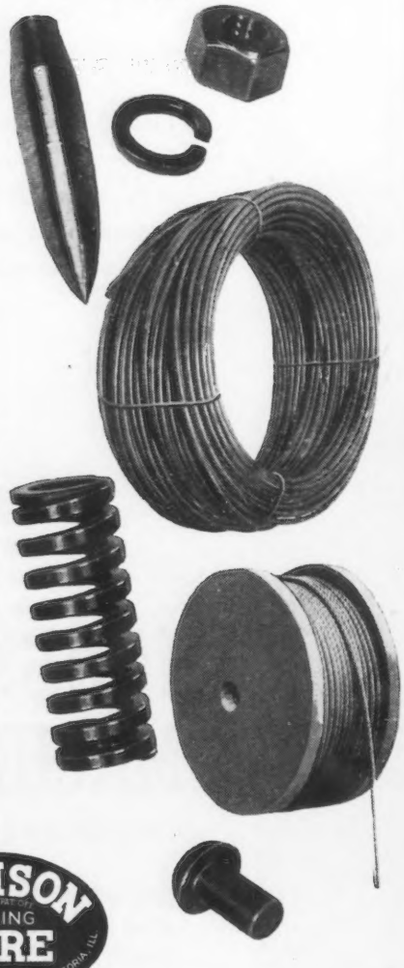
Every time the U. S. fleet engages the enemy, thousands of wire mill products play their essential supporting roles. In ammunition, guns, communications and ship construction, wire helps complete the fighting efficiency of every ship. Air forces and land forces, too, continually "draft" huge tonnages of wire mill production.

"First call" reasons are these why Keystone, along with the country's other leading wire mills, is turning out its highest maximum tonnage.

And on this industrial march to Victory, vastly significant developments in wire performance are being made. After Victory, these developments should streamline production for an INTENSIFIED civilian demand.

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

Just a few of thousands of wire mill products for war uses.



Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Five Fluorspar Producers Expected to Begin This Year

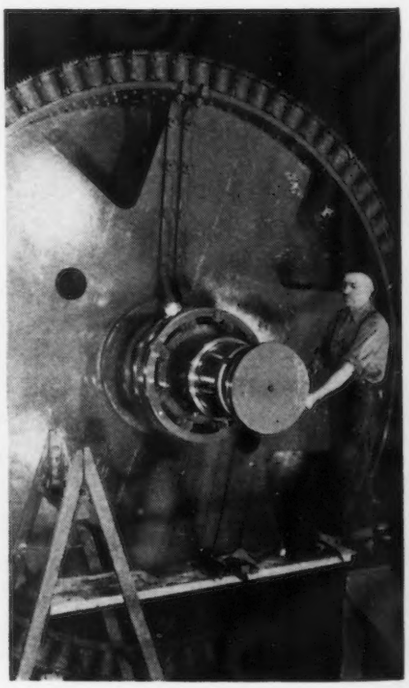
Washington

• • • **At least five** new producers of metallurgical grade fluorspar are expected to come into production in 1943 according to present plans, which should add another 60 000 tons of this critical material to the supply available to the nation's steel mills, it was revealed last week at a meeting of the Fluorspar Advisory Committee.

Reports showed that the production of metallurgical grade dropped 15 per cent in December from previous months. While this decline is serious, it was not unexpected, for unless some way is found to provide adequate manpower for the mines, a continuing decline in production must be expected.

The new reporting form for fluorspar producers prepared by WPB indicates that development is being done by about 75 per cent of the mines and that 45 per cent of the mines expect increased production if labor is available in sufficient quantity.

POWER FOR A TANKER: This 30-ton rotor is part of a specially-designed 6,600-h.p. tanker engine being built by the Westinghouse Electric & Mfg. Co. One of forty ordered by the Sun Shipbuilding and Dry Dock Co., the engine will propel a United States Maritime Commission's new 21,000 ton oil tanker.



Small Plants Gain in Awards Made by Army

Washington

• • • **Over a billion** dollars worth of Army contracts have been placed during the last two months with concerns employing from 5 to 500 persons, it was announced Jan. 18, by Lou E. Holland, deputy director of the WPB and chairman of the Smaller War Plants Corp. "During November and December alone," Mr. Holland pointed out, "seven supply services of the War Department awarded 43,056 supply contracts totaling $846,000,000 to small plants. These contracts account for 24 per cent of the total dollar volume of all contracts awarded by these services during these two months. Additional subcontracts were distributed by the Army among 3,274 firms with a total spending of $151,500,000."

The Air Forces procurement officers at Wright Field in Dayton, Ohio, have placed during November and December a total of $50,300,000 among 733 firms employing less than 500 wage-earners. This business, Mr. Holland said, was increasing steadily.

PROTECTED: This girl punch press operator in a shop of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., cannot get a hand injury in the machine because of a special safeguard. The safeguard consists of controls which require the use of both hands to start the press in operation.

Here's HIGH-VELOCITY OUTPUT FOR YOU!

LAMSON

. . . JUMPED SHELL-FUSE PRODUCTION 2½ TIMES *with a Carousal Conveyor!*

All it took was a trial installation of one Conveyor in the Assembly Department of an Ordnance plant, and production per day was stepped up 2½ times—with the same number of operators! So outstandingly successful was this trial unit that eleven other conveyors were installed. And to top it—*the savings effected by each Conveyor returns its purchase price every two months!*

Simple, efficient movement of material is vital to your production, too. Whether it's on assembly lines or to and from warehouses and shops—a Lamson Conveyor can contribute great savings in time and man-power. Let us study your materials handling problem, and if there's room for improvement let Lamson Conveyors give you top efficiency!

LAMSON CORPORATION

Makers of CONVEYORS and PNEUMATIC DISPATCH TUBES

SYRACUSE, N. Y.

New Plans Laid for Alloy, Bessemer Steel

Washington

• • • **WPB is actively** engaged in making new plans and pursuing new requests gaged to increase alloy steel production, increase the consumption of bessemer steel to relieve the open hearths and where possible to shorten the demands for certain grades of alloys and stainless.

Recommendations have been made that more open hearth capacity be devoted to alloy steel production with a compensating utilization of a greater proportion of bessemer capacity. For 1943 it is estimated that if the entire bessemer facilities were engaged approximately 6,500,000 tons would be produced. Only 83 per cent of capacity is now engaged. Some WPB officials say more than 1,000,000 tons of bessemer steel in addition could be produced for essential use.

In the alloy field, ferrochrome threatens to be a trouble spot. The reason is not lack of ore but lack of electric furnace capacity to melt enough chrome to keep up with Army and Navy demand. Army and Navy have been asked by WPB to reduce their stainless steel requirements by 30 per cent during February and March to enable industry to catch up. The shortage is in low carbon stainless. The aircraft program is said to be consuming 50 per cent of all stainless steel produced.

Alloy capacity is expected to rise to a rate of 1,500,000 tons monthly this year but the rate is not expected to be maintained for the entire year, WPB officials say. Efforts are being made at WPB to increase open hearth alloy steel production by 200,000 tons monthly through the addition of hot-topping equipment and plant alterations.

Warehouses Allowed To Quote on Gross Weight

• • • **Warehousemen** who are required by government agencies to quote storage and handling rates on packaged commodities on the basis of gross weight may change their maximum prices from a net weight basis to a gross weight basis, OPA announced. OPA pointed out that because of special packaging requirements for Lend-Lease shipments, packaging on many commodities is heavier than usual. These packages require the same amount of warehouse space and are just as hard to handle, even though the contents weight is considerably less in relation to the gross weight. The new formula allows the warehousemen compensation for this increased tare.

•

Regional OPA to Warn Price Regulation Violators

• • • **State Directors** and District Managers of OPA were granted authority to issue license warning notices to licensed sellers who in their judgment have violated price regulations. The delegation of authority is contained in Revised General Order No. 27 issued and effective Jan. 22. License warning notices are sent by registered mail to sellers who, in the judgment of OPA officials, have violated price regulations. If a seller commits another violation after receipt of the warning notice, OPA may go into court and ask that his license be suspended for a period of not more than one year.

•

Concrete Bar Bids

• • • **Application** of maximum prices to lump-sum and average price bids and contracts for furnishing fabricated steel bars used to reinforce structures made of concrete are defined by the OPA in MPR No. 159 by Amendment No. 2, effective Jan. 25.

Bids must not be made at prices which are higher than the applicable maximum prices for the different quantities, sizes, and specifications of fabricated concrete reinforcing bars. An additional provision directs that after completion of the job, the contract price must be adjusted so that the total does not exceed the sum of the applicable maximum prices for the quantities, sizes, and specifications used.

•

Precision Instruments

• • • **Instruments** for measuring, testing, recording and indicating and other precision devices, which are motivated by electricity but do not measure electrical quantity, were formally placed under the machinery regulation.

OPA pointed out that these instruments had been considered as covered by the regulation. However, as some confusion has prevailed an express category has been added by Amendment No. 67 to MPR No. 136 effective Jan. 27.

•

Sellers Must Await Approved Price Increases

• • • **Sellers who have** applied for increases of their maximum prices, either under the General Maximum Price Regulation or under specific regulations, can not charge in excess of their existing maximum until such an adjustment is granted or unless they receive special permission to do so from OPA.

ON SEA AS ON LAND: With the news of Russia's land offensive emphasized, very little attention has been given to the Russian offensive on the seas surrounding her coast. Photo shows torpedo boats setting out on a fighting assignment from their base.

Acme

WLB Decentralizing to Aid Regional Labor—Salary Disputes

• • • **In a decentralizing** move WLB announced the establishment of 12 new regional war labor boards with full authority to make final decisions in labor disputes and in voluntary wage and salary adjustment cases. These new boards, set up on the same tripartite basis as the national board, will be handling cases in the next ten days.

All new cases automatically will go to the regional boards, except cases in certain specialized fields including the non-ferrous metals industry, trucking, shipbuilding and the building trades, in which special commissions have been established.

Cases will be certified to the WLB by the Secretary of Labor after conciliation efforts by the U. S. Conciliation Service have failed to settle the controversy. The WLB in all but exceptional situations will refer each case upon its certification to the appropriate regional board. The U. S. Commissioner of Conciliation in charge of the case in the field will then obtain statements and exhibits from the parties and turn these over to the tri-partite panel of the regional board which is to hear the case.

The function of the panel will be not to mediate but to get at the facts and make recommendations to the regional board for final action. A liaison commissioner of concilation will work with each regional board.

• • • **Some further personnel** changes were announced in WLB and WMC this week with the appointment of Lawrence A. Appley, vice-president of Vick Chemical Co. as WMC's executive director, advancement of Lloyd K. Garrison, WLB's general counsel to executive director with Burton E. Oppenheim named as deputy executive director from special assistant.

• • • **Still uncontent** to allow a controversial subject to die, Paul V. McNutt is again quoted as saying a labor draft is likely . . . this time in 1944. He stated that single induction centers for all of the armed forces would soon be in effect and that allocation of manpower "is literally possible by June 1944."

•

Basic Wage Accepted To Settle Canadian Strikes

Toronto

• • • **A seven-point** peace plan presented to the Algoma local of the USWA-CIO, which embodied a 55c. basic wage minimum throughout the Canadian steel industry plus the accepted cost-of-living bonuses, seemed likely to fully settle the fast-spreading dispute that has crippled Dominion steel production for several weeks.

Most appealing factor in the new plan is that the basic wage increase will be effective retroactive to Nov. 1, 1942, a haggling point which has thrown out the mediation efforts on preceding attempts. The plan also granted that cost-of-living bonuses, whether altered upward or downward, will not effect the basic wage minimum, making it an absolute minimum.

The union balloting to accept the latest proposal was concluded this week and early settlement on these terms is believed imminent.

Manning Tables of Eastern Firm Set

New York

• • • The Square D Co.'s Kollsman Instrument Division plant here is the first organization in the State, and one of the first in the United States, to complete approved Manning and Replacement Tables, according to F. W. Magin, president, who on Jan. 23 quoted information received from the War Manpower Commission regional office.

The Manning Tables list separately each kind of job in the plant, together with the number of workers employed on that job and their classification as to age, sex, family situation, and Selective Service Board status. The Withdrawal Tables list the men who are elegible for induction, with a monthly schedule covering their release during the ensuing six months, according to the time required to secure and train replacements.

•

Heavy Jobs Claimed By More Women than Men

Buffalo

• • • **The concerted drive** of the heavy industries and the War Manpower Commission to bring back into the fold the strong men who have drifted into lighter war industries has produced more female than male applicants for such work. Steel plants here have begun to hire women for all types of work.

At Republic, 250 women have been hired. Some are on inspection and in metallurgical and chemical laboratories, others are helping unload heavy materials from freight cars.

"Powder rooms" are being constructed at Bethlehem and within a few weeks a drive may be made to hire about 500 women to work in many departments, it is understood.

Thirty to 40 women now are employed by Wickwire-Spencer, mostly in the wire plant.

•

Air Force Gets Tough With Bohn Wildcat Strikers

Detroit

• • • **The Army Air Force** augmented its get-tough policy with wildcat strikers recently when it asked for and secured discharges of eight employees involved in a series of wildcat outbreaks at the Bohn Aluminum & Brass Corp. plant during December. One of the eight had already left Bohn and secured a job at the Packard Motor Car Co., from which he was discharged at the request of the Army.

•

Conciliation Ends 6-Day Sympathy Strike

Buffalo

• • • **A sympathy strike** of several hundred men at the Lackawanna plant of Bethlehem Steel Co. came to an end last week when workers in the electrical maintenance department returned to their jobs after a six-day dispute over a

schedule set for a "dangerous job." The company said no production was lost.

•

CIO Loses Election

Harrisburg

• • • **In a surprise result** something like "man bites dog," the CIO lost an NLRB election in the steel industry to determine the collective bargaining agent for the Harrisburg Steel Corp. during an official poling held last week. The worker's choice was between CIO union representation or no representation on a collective basis. The election results were 1090 to 836 against the CIO.

•

Manpower Meeting Set

• • • **Executives** from war industries will meet with officials of the War Manpower Commission at the Palmer House in Chicago on Feb. 10, 11 and 12. The meeting will be the annual conference of the personnel division of the American Management Association.

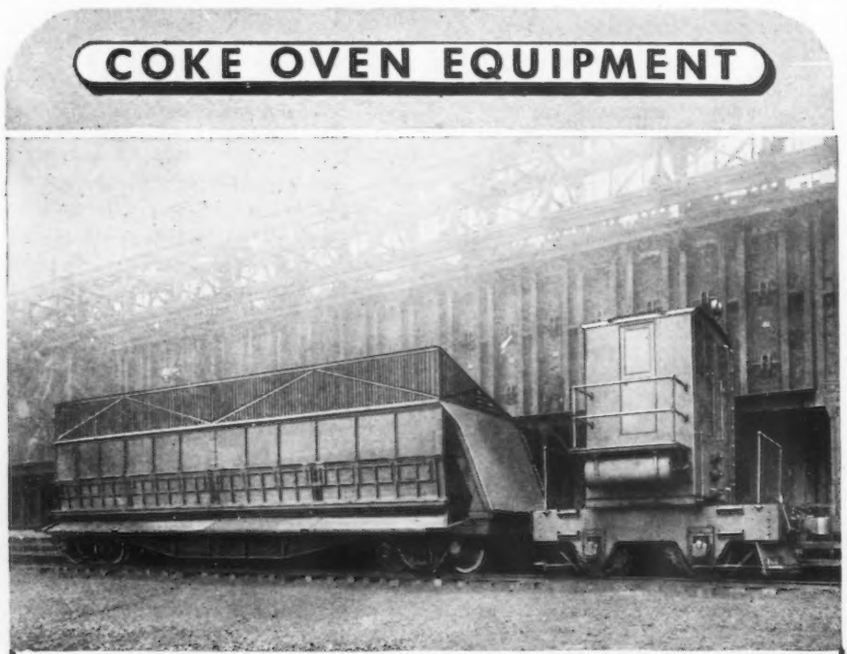
•

WMC to Increase Labor Stabilization Area

Cleveland

• • • **Extension of the labor** stabilization program to industrial districts close to Cleveland, in Lorain, Lake Ashtabula, and Geauga counties, will soon be effected by the War Manpower Commission. These four adjacent counties have been added to the WMC's Cleveland area, which "froze" more than 300,000 Cuyahoga County workers in essential industries to their jobs as of Jan. 6.

SMALL WAR PLANTS CHIEF: Col. Robert Johnson, head of the New York Ordnance District for the Army, has been appointed by President Roosevelt as director of the Smaller War Plants Corp. He supplants Lou E. Holland. Col. Johnson also was named a vice-chairman of WPB.



QUENCHING CARS AND LOCOMOTIVES

All Atlas Coke Oven Equipment is of heavy-duty construction permitting the peak operating conditions required in today's stepped-up production schedules. As a result of years of experience, Atlas is able to design and build equipment, to meet the requirements of each particular coke plant. Detailed information available on request.

Other ATLAS Products

Ore Transfer Cars
•
Scale Charging Cars
•
Electrically Operated Cars for Every Haulage Purpose

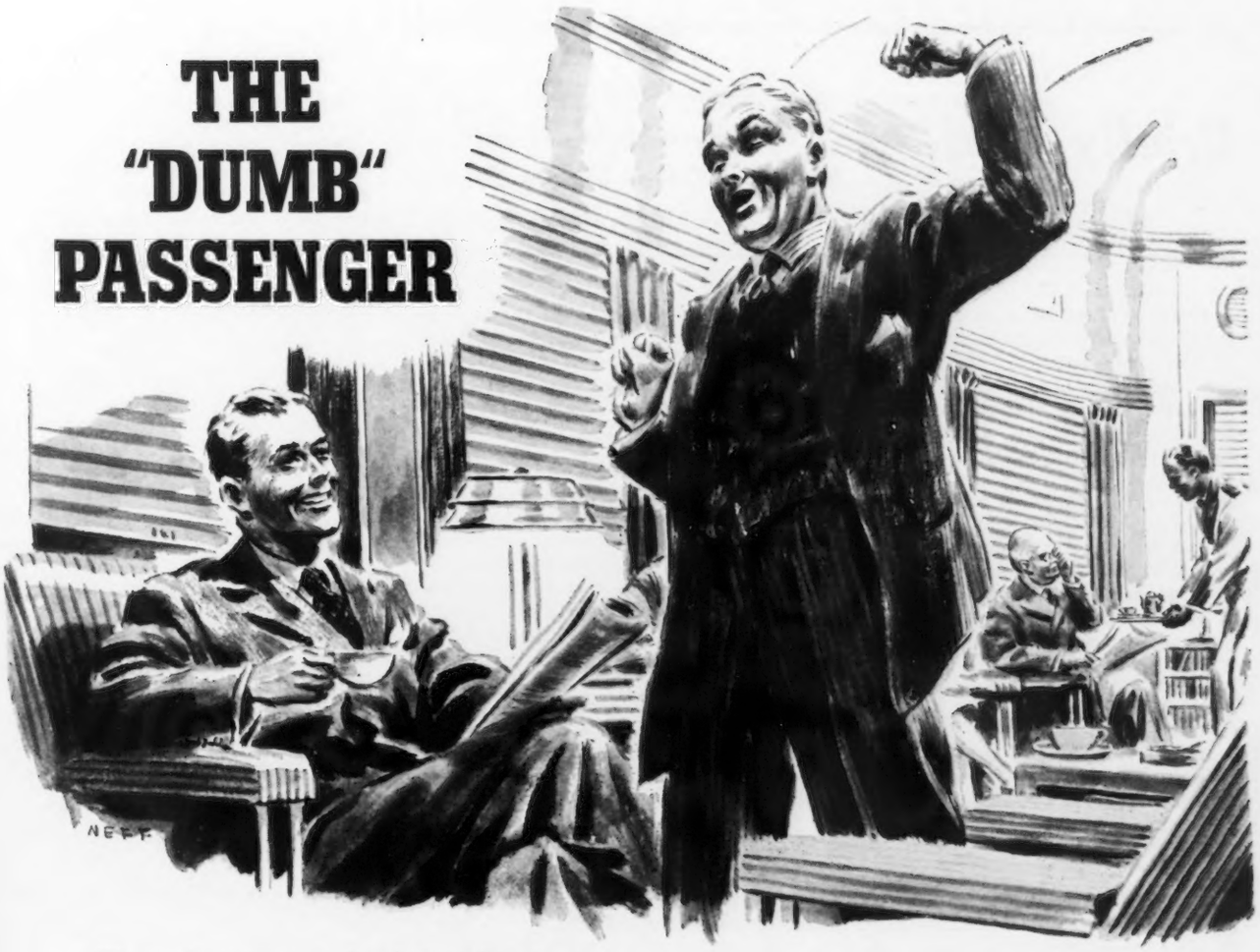
Locomotives for Switching and Interplant Haulage
•
Turntables

The ATLAS CAR & MFG. CO.

ENGINEERS MANUFACTURERS

1100 IVANHOE RD. CLEVELAND, OHIO, U. S. A.

THE "DUMB" PASSENGER



The crack express was already pounding its way west when the reporters decided to call it a night. Tomorrow's job—a feature story on a war industry—meant miles of walking, and they knew it. "Looks like a swell story," said the one, and the other yawningly agreed. "We'd better turn in," he added.

* * *

Up forward, bound for the same destination and restless with the sway of the baggage car, lay another passenger—a mute, inert bundle of steel. Could it have spoken, it might have pointed up their story.

Six hours ago, it had lain in a freight car, buried under 15 tons of its kind. Ordered while en route to a warehouse, it had been released by an emergency call when still in the car. Warehousemen had unloaded the entire car to reach it, had raced to get it to the station, had placed it aboard the express while even the conductor's watch frowned. Tomorrow this bundle of steel would meet its destiny—on a production line dedicated to freedom.

Hardly a headline story, this, but the final story of America's war production will be a total of thousands like it.

For behind America's might is a host of such small, *extra* efforts. The common denominator of our production victory . . . will be that extra heave on a wrench, that extra swing of a hammer, *that extra try* . . . that wins.

Frasse

Mechanical and Aircraft STEELS

Peter A. Frasse and Co., Inc., New York, Philadelphia, Buffalo, Jersey City, Hartford, Rochester, Syracuse

Briefly Told—

Summary of Recent Industrial News and Other Timely Events

• **Pliofilm is being used** in the nation's war effort to save thousands of vital man-hours in the handling and shipment of airplane engines, Goodyear Tire & Rubber Co. officials have disclosed. They said that their entire output of Pliofilm is being devoted to the moisture protection of these engines and other vital mechanisms being used in our military effort. Use of Pliofilm for plane engine coverings, it was estimated, saves from 50 to 75 man-hours ordinarily needed to grease and de-grease each engine.

•

• **Construction contracts** to a total of $8,255,061,000 were awarded in the 37 eastern states during the calendar year 1942, F. W. Dodge Corp. announced. This was 37 per cent greater than the total for the preceding year.

• **The third collection of tin cans in the Detroit area brought in the largest amount yet gathered, somewhat over 1100 tons. Movement of the cans to detinning plants began at once.**

•

• *The Dodge Division of Chrysler Corp. has gone into quantity production of Sperry gyro-compasses. Manufacture includes one of the most delicate jobs yet devised—output of strands of wire to suspend the gyro-tops. Each strand consists of 18 separate wires, each .009 in. in diameter.*

•

• **The final 1942 score** in the Great Lakes shippers' private war against the Axis was announced recently by A. T. Wood of the Office of Defense Transportation. Despite unfavorable weather in April and during practically all the final 45 days of the season of navigation, said Wood, the bulk freight commerce of the Great Lakes in 1942 mounted to the staggering total of 178,577,828 net tons. The iron ore movement was 92,076,781 gross tons, or 103,125,995 net tons. The total exceeded the previous all-time high, established in 1941, by 5.65 per cent, while the ore movement was 14.93 per cent greater than the earlier record set in 1941.

•

• **Hailed by the Navy** as one of the fastest flying boats ever built in America, if not in the world, Consolidated Aircraft Corp.'s twin-engine model 31, equipped with the latest combat developments, will go into mass production at the new factory in New Orleans. The plant was recently taken over by Consolidated from the Nash-Kelvinator Co. The announcement was made by Rear Admiral Ralph E. Davison, assistant chief of the Navy Bureau of Aeronautics.

•

• *Nuts and bolts in steam turbines and on other heavy duty jobs can be made 40 per cent stronger by giv-*

OUT OUR WAY
BY J. R. WILLIAMS
SAY, DIDJA SEE THAT GLEAM IN THE BULL O' TH' WOODS EYE? LOOKS LIKE HE FINALLY CAUGHT OLD DAVE SLIPPIN' UP ON A JOB!
NO, THAT AINT IT... IT'S JUST THERE'S SO MANY COLLEGE GRADUATES AND WHITE COLLAR GUYS AROUND THE PLACE THESE DAYS THE OLD BULL'S TICKLED TO FIND SOMEONE WHO TALKS HIS OWN LINGO!
THE KING STOOPS
J.R.WILLIAMS
We know how the 'Old Bull' feels...
THIS WAR has changed things for everyone ...we all must keep on working harder, longer, better than we ever did before. This is the only way we can guarantee our ultimate victory. And at the same time, by our own foresight, by looking ahead and planning for the day when peace is won, we can do much to make sure that the boys on the fighting fronts will come home to jobs, to the opportunity to build a real future, to economic security and happiness. Let's waste no time in fulfilling this obligation to the very best of our ability...by tackling our post-war problems now.
(Below) A few of the many thousands of our precision-made parts that help "Keep 'em flying and fighting."
ERICSSON
ESTABLISHED 1911
ERICSSON
SCREW MACHINE PRODUCTS CO., INC.
25 LAFAYETTE STREET, BROOKLYN, N. Y.

Why PREforming Conserves Steel, Makes Wire Rope Last Longer

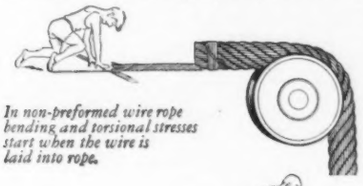
(Note: More and more wire rope users change to PREformed rope each year. During peacetime the reasons for changing from ordinary to PREformed wire rope were primarily two: the cost is lower; PREformed is easier to handle.

Today, with our nation at war and with steel at a premium, there is another and most important reason for using PREformed. It lasts much longer under high speed, severe bending and continuous operation. PREforming thus conserves steel. It conserves workmen's time; rope changes are less frequent. It reduces the accident potential; there is no wickering to harm hands or damage sheaves.)

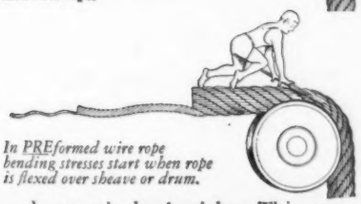
There are two kinds of wire rope. One is called Regular, or ordinary, wire rope. The other is known as PREformed.

In ordinary rope wires are held together under tension. The wires are laid into the rope by bending them to the desired shape. Bending and torsional stresses thus remain in the rope . . . are kept under control by seizing the ends of the rope.

If the wire breaks, it immediately wickers. If the seizing breaks, the strands



In non-preformed wire rope bending and torsional stresses start when the wire is laid into rope.



In PREformed wire rope bending stresses start when rope is flexed over sheave or drum.

and rope wire both wicker. This causes damage and delay. In PREformed wire rope, the strands and wires are preshaped to the exact curvature they will take in the finished rope. Bending and torsional stresses are eliminated (except of course when the rope bends over a sheave). If a wire breaks, it does not wicker but remains relaxed, thus causing no delay or damage.

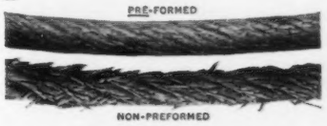
Advantages of PREforming

PREformed wire ropes are like shoes that have been broken in. Instead of being stiff and unwieldy, they are flexible, easier to handle.

They are better adapted to bending and spooling, also. They resist kinking

when the rope is not under load.

PREformed wire ropes are easier to handle also because broken wires lay flat.



And finally, most important, PREformed wire ropes have greater resistance to bending and fatigue. This is

another way of saying that they last much longer, do a better job when the pressure is on, as it is today in war production.

When next you need wire rope, consider seriously the purchase of PREformed wire rope. Today the job we must all do is the "best" job possible. When it comes to wire rope there is no question as to which does the "best" job. It's PREformed.

Consult with Macwhyte

Don't overlook the help that Macwhyte engineers will gladly give you on any wire rope problem. Their advice gained from many years' work on all kinds of jobs is yours for the asking. Let us know the kind of work to be done; we will tell you the rope best suited for the job.

And this we urge you to do: take extra care of your present ropes. Inspect them regularly; lubricate them often. By so doing you can make them last longer and thus aid the war effort. That's what you want; that's what your country asks of you.

This is Number 13 in a series of informative articles prepared by the Macwhyte Company to help wire rope users obtain better and longer service from ropes on the job. All articles in this series are available on request.

MONARCH Whyte Strand PRE-FORMED WIRE ROPE

. . . Macwhyte premier wire rope, famous for its strength, toughness, and internal lubrication.

NO. 652

MACWHYTE COMPANY

WIRE ROPE

2940 FOURTEENTH AVE. KENOSHA, WISCONSIN

Manufacturers of MACWHYTE PREformed and Internally Lubricated Wire Rope MONARCH WHYTE STRAND Wire Rope
MACWHYTE Special Traction Elevator Cable MACWHYTE Braided Wire Rope Slings MACWHYTE Aircraft Cables and Tie-Rods

ing them broad shoulders and tapered bodies, according to Dr. Miklos Hetenyi, of the Westinghouse Research Laboratories. He explained that his new tapered design distributes stress more equally evenly on the threads of nuts and bolts. On conventional types the bottom thread carries most of the load.

•

• **L. A. Umansky, assistant manager of the Industrial Engineering Dept. of General Electric Co. recently reported an extremely successful substitution of silver for copper in electrical installations to the Detroit District Section of the Association of Iron and Steel Engineers. Aluminum, he said, is also being substituted for copper in buses and cables.**

•

• **Construction projects** having a total cost of $1,214,850,897 have been stopped during the last twelve weeks in line with the policy of curtailing non-war work to free materials, equipment and other resources for more essential uses, it was announced Jan. 20 by WPB.

Many of these projects were halted by the programming agencies, while others were stopped by WPB through revocation of priorities. Included in the total are projects costing $19,026,956, which were ordered stopped during the week ended Jan. 15.

•

• **Record-breaking production** of gun mounts carrying four rapid-fire anti-aircraft guns — the weapons which hurled hundreds of shells a minute at Japanese planes in the battles of Pearl Harbor, Midway and the Solomon Islands—has been disclosed by the Westinghouse Electric Co., Jersey City, N. J. The 1.1 in. multiple gun is now in service on every type of American fighting ship. The British affectionately call this gun "The Chicago Piano."

•

• **Production of castings in nine months of 1942 at the Grove City plant of Cooper-Bessemer Corp. practically equaled the entire output in the previous 12 months, the company said recently.**

•

• **Glenn L. Martin**, president of the Glenn L. Martin Co., Baltimore, was elected president of the Aircraft War Production Council, East Coast, Inc., at a general meeting in Buffalo recently. He succeeds Guy W. Vaughan of Curtiss-Wright, Inc. J. Carlton War, president of Fairchild Engine & Airplane Co., was elected vice-president, while I. S. Randall, general manager, and Miss Julia M. Scanlon, secretary-treasurer, were re-elected.

•

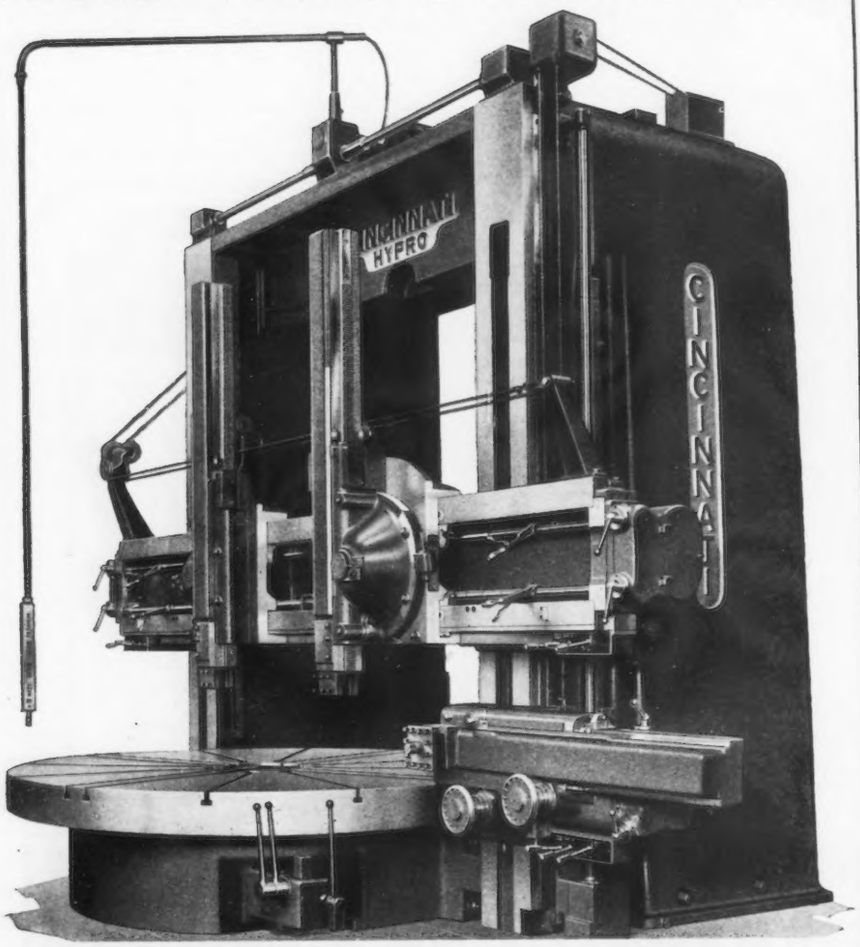
• **A new booklet titled** "Fansteel Electrical Contacts" has been issued by Fansteel Metallurgical Corp., North Chicago, Ill. It contains practical notes on design for better contact performance and is intended as an aid to designers of electrical equipment and appliances. Detailed descriptions of contact metals, alloys and powder metallurgy compositions, together with a contact selector chart help the designer to select the correct contact material for a given application.

•

• **Despite an accelerated** rate of shipments of war goods during October, the auto industry's backlog for armament stood at a 22-month level as of Oct. 31, it was reported last week by R. L. Vaniman, director of the WPB Automotive Division. Shipments from plants of the auto industry in October amounted to $646,920,000. The war order backlog at the end of October was put at $11,645,920,000.

Cincinnati

HYPRO VERTICAL BORING MILL

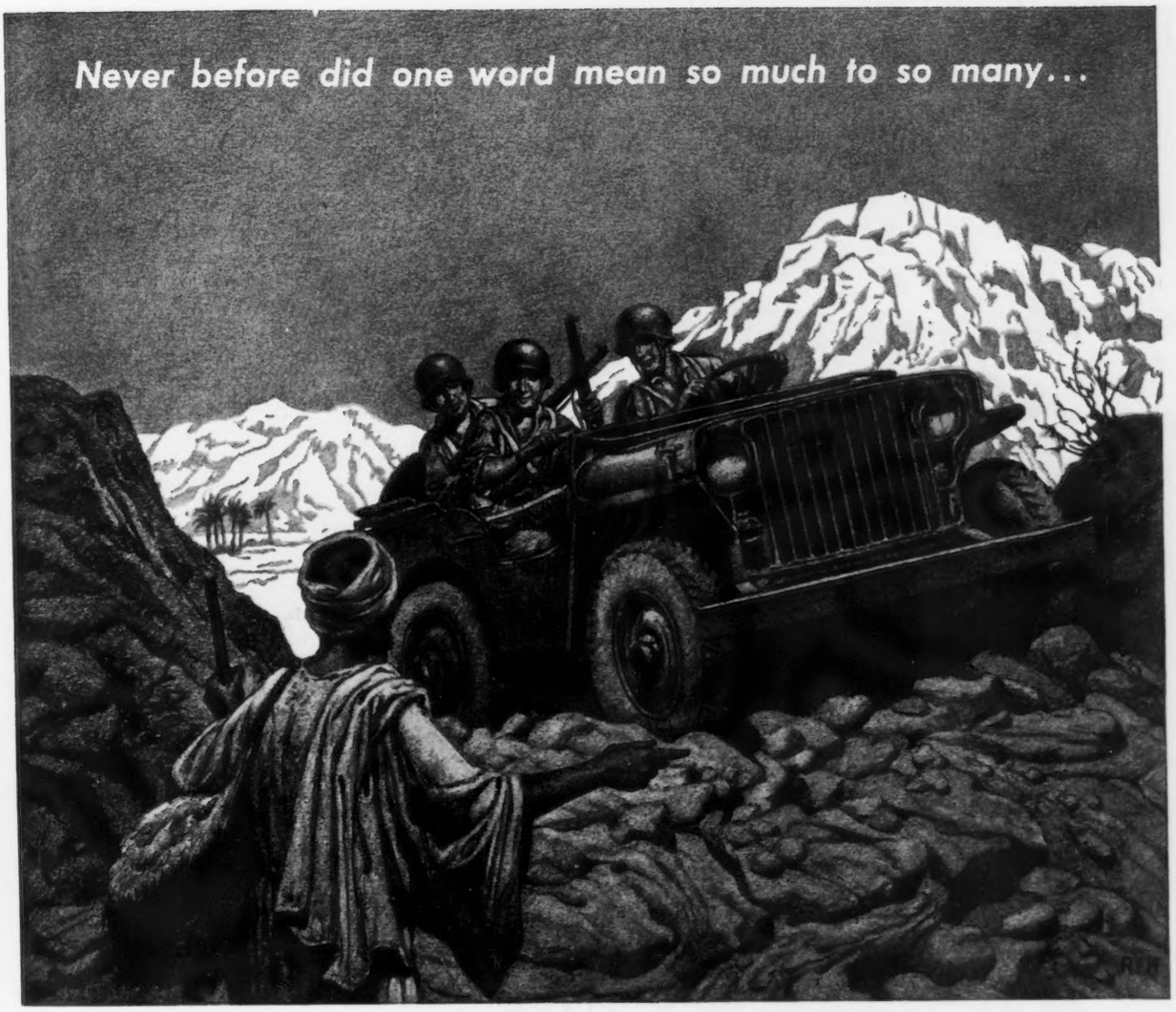


This 10′ Boring Mill Is Now Available for Early Delivery.

PLANERS · PLANER MILLERS · BORING MILLS

THE CINCINNATI PLANER CO.

CINCINNATI, OHIO



You can serve by CONSERVING

Name a continent . . . and you've named an American battlefront. From Tunisia to Timor, from India to Iceland, Americans and their Allies face a need for more arms and equipment . . . more tanks and trucks, more planes and ships and guns.

And those modern weapons need alloy steels in vital parts. Nickel steels, for example, that provide extra toughness, strength and added resistance to shock and impact. No need to tell you how essential these qualities are to the equipment of our armed forces.

That's why it's so important to *conserve* critical alloys. Every possible pound must be saved for our fighting men.

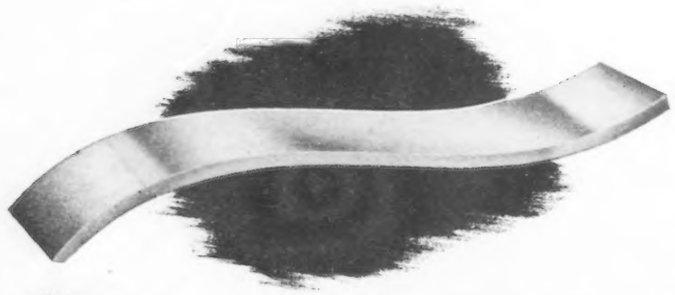
The best way to help is by making sure all metal scrap in your plant is properly segregated. Collect ferrous and non-ferrous scrap, in separate containers, at the machines where generated.

High-speed tool steels and alloyed constructional steels should also be collected and salvaged separately. When in doubt . . . segregate!

If metal problems are bothering you—if you would like suggestions for extending your own metal conservation program—call on our technical staff for "CONSERVICE,"—a new name for counsel and data that will help you conserve.

* * **Nickel** * *

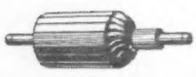
THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.



Note some of the important jobs done by **PAGE STAINLESS STEEL WIRE**

As Rifle Springs. Now with the armed forces throughout the world.

As the wire for corrosion-resisting steel of the controls of aircraft.



As the binding wire for armatures —because of its non-magnetic properties.

For a few more jobs using **PAGE *Stainless* STEEL WIRE:** Lock Wire, Safety Wire and for corrosion-resisting Cotter Pins.

THAT'S WHERE PAGE *Stainless* STEEL WIRE IS GOING TODAY

WHAT OF TOMORROW?

As long as America is at war, Stainless Steel will be on the list of critical materials—and **PAGE** will continue to allow no consideration to interfere with full production for war.

However, if you vision lower-cost Stainless Steel after the war and are planning to use Stainless Steel wire for markets that will then open up, you will find it worthwhile to discuss your ideas with **PAGE.**

PAGE *Stainless Steel* Wire

PAGE STEEL AND WIRE DIVISION
Monessen, Pa., Atlanta, Chicago, New York, Pittsburgh, San Francisco

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

Outlines 7-Point Plan For Firms in Post-War Era

Chicago

• • • **A seven-point** program for manufacturers' post-war operations was outlined last week by Oscar N. Lindahl, finance vice-president, Carnegie-Illinois Steel Corp., in an address before a meeting of the Illinois Mfg. Costs Assn.

Mr. Lindahl outlined a program of wartime planning to meet post-war problems which was prepared by a committee of the Controllers Institute of America of which he was chairman.

"Any comprehensive program for post-war operation," Mr. Lindahl said, "should include consideration of the following principles:

"1. Relations with employees must be placed on sound basis.

"2. Financial structures must be protected. Adequate working capital must be maintained and reserves set up for post-war losses due to wartime operations. All forms of wasteful expenditure must be scrupulously avoided. Plants must be kept in the best possible physical condition.

"3. Unbalanced or speculative inventories must be avoided. An accounting system which helps place inventories on a conservative valuation basis should be installed. Obsolete material and equipment should be cleaned out.

"4. Loose extension of credit should not be permitted. Nevertheless, customers who are doing business largely on borrowed capital should receive careful consideration.

"5. Cost procedures should be modernized. Every element of cost should be examined with the idea of reducing it—and then reducing it again. A start should be made now to trim expenses.

"6. Business mobility must be developed. The appearance of new products demands that companies learn the merits of competing products as well as the merits of their own products in new fields. Regular products must be perfected and new ones developed.

"7. Excess plant facilities should be definitely ear-marked. Data on all facilities should be separately recorded and production costs determined for material produced in them. Any facilities classified as excess would then include those responsible for the highest costs.

Secondary Copper Use Urged at Detroit AIME

Detroit

• • • **Faced with a likely** 25 per cent shortage in the supply of copper this year, specification writers were urged by Carter S. Cole, chief of the Metals Section of the Conservation Division of WPB, to use secondary copper instead of electrolytic metal where end uses make the switch possible. This request was made by Mr. Cole in a speech before the AIME January meeting in Detroit.

Mr. Cole also recommended a turn to ferrous metals instead of copper wherever possible. He expressed the viewpoint that a shift from brass cartridge cases to steel would tend to increase total output rather than realize appreciable savings in copper. He also made mention of the chart issued recently by WPB showing how lower alloy specifications could be utilized satisfactorily in place of formulas requiring higher grades of metal.

Against a supply of 2,600,000 tons of copper during 1942, Mr. Cole said availability will be larger but essential and military needs will multiply the eight per cent shortage of last year to around 25 per cent.

Copper scrap will soon be ordered segregated, he stated.

Plane Modification Center Under Construction in South

Birmingham

• • • **Ground for** an airplane modification center here to cost more than $10,000,000 was broken Jan. 15 with Brig. Gen. K. B. Wolfe of Wright Field, Dayton, Ohio, and Ralph M. Parsons, vice-president of the Bechtel - McCone-Parsons Corp., principal speakers.

The BMP corporation is building and will operate the modification plant which will be on a 300-acre site.

The planes to be modified to make them ready for action in the various war theaters will be built by various manufacturers.

Although the plant was originally designed as a wooden structure, the Army Air Forces directed its conversion to steel.

WHAT'S MY BUSINESS?

It's not manufacturing. It's not construction work. After 23 years, I still have to explain this to people who don't know what we do.

Ours is a firm of consulting management engineers. We don't manufacture machinery, and we don't build buildings.

We do make business surveys for management, directors, bankers or investors to determine the earning possibilities of a company.

We help management in setting up its management program, policies, organization chart and manual.

We assist in devising and installing cost and budgetary controls, compensation plans, and executive reports.

We make market studies and recommend improvements in selling methods.

We assist in the installation or improvement of manufacturing methods, facilities, and organization.

We design and install production control, which includes inventory and material control, planning, scheduling, and dispatching the work.

We make job evaluation studies for factory and office occupations, and assist in their installation.

We advise in the design and development of products, and in the design and development of machinery and tools.

How did I get into this business? It happened in the last World War. I was then in a war production plant. And in that 1916-18 war production drive, I learned this basic fact—

"Labor is just as efficient as Management plans for it and provides tools with which to work."

With that as a premise, I started The Trundle Engineering Company as a consulting engineering firm. The firm grew. We now have offices in New York and Chicago, as well as Cleveland.

★ ★ ★

That is the business I am in. Or, I should say, that is the business our company is in—because I am now only one of over a hundred management engineers in the employ of The Trundle Engineering Company.

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

CHICAGO CLEVELAND NEW YORK

Hendy Purchases Join Marine Engine Production

• • • **The purchase by** the Joshua Hendy Iron Works, Sunnyvale, Cal., of the Pomona Pump Co. and its subsidiary, Westco Division, and the Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., has integrated the plants' production of marine engines, steam turbines, turbo-generators, pumps and other ship fittings and equipment, supply of which has been a major cargo shipbuilding bottleneck.

The Hendy company is turning out eight to ten 2500-hp. triple expansion steam engines for EC-2 freighters a week, and production is reported increasing. During the entire course of World War I, the plant, which had been established in 1856 to turn out gold mining equipment, was able to produce only about a dozen marine engines similar to those now being built.

Through purchase of the 55-year-old Crocker-Wheeler Electric Mfg. Co., the company expanded its line from steam engines and turbines to turbo-generators, motors, and other electrical equipment. To attack other bottlenecks which were holding up installing of motors, the company next purchased the Pomona Pump Co., and Westco Division, with one plant at Pomona, Cal., and two at St. Louis. In addition a new 25-acre plant at Torrance, Cal., has been purchased and equipped for manufacture of pumps by Pomona.

Firm Voluntarily Pays Back to U.S. Treasury

Chicago

• • • Foote Bros. Gear & Machine Corp. is making a voluntary adjustment of its selling prices under certain government contracts and will return $2,059,965 to the U. S. Treasury, William A. Barr, president, has revealed.

When final fiscal results could be foreseen, the management decided to make price adjustments on certain items and further to make a voluntary retroactive price adjustment of those items sold during the year. The Navy price adjustment board recommended that the adjustment be paid to the U. S. Treasury. The payments are being made in four monthly installments, beginning Jan. 15. Improvements in production techniques during the year were said to be an important factor in making the adjustments possible.

Aluminum Co. Uses Lower Grades of Bauxite

• • • **Twenty-five years of research** by the Aluminum Co. of America has resulted in the development of a practical method of extracting from the lower grades of bauxite as high a percentage of alumina as was formerly obtained from high-grade bauxite.

Work on this process was speeded up in the last five years and what was originally set up as an experimental plant has become an actual manufacturing unit. The new Defense Plant Corp. plant built and operated by the Aluminum Co. at Bauxite, Ark., was designed to use this process.

Any Shape he Draws A UNISHEAR can Follow!

. . . and cut it FASTER than any other tool!

Wherever sheet metal departments are "beating the promise", you'll find Stanley Unishears on the job. They slice through sheets as fast as you feed, up to 15 feet per minute – follow any line accurately, straight, curved or angle – leave smooth, clean edges with no distortion. Plenty of power and ruggedness for tough production or maintenance use.

Portable models with capacities up to 12 U. S. gauge hot rolled steel. Stationary models to handle sheet metal up to 10 gauge. Stanley Electric Tool Division, The Stanley Works, 137 Elm St., New Britain, Connecticut.

STANLEY

STANLEY UNISHEARS
The Electrically Driven Hand Shears

TOOLS ARE THE WORKER'S WEAPONS IN A TOTAL WAR. KEEP THEM ON THE JOB WITH PROPER CARE. . . .

Ore Consumption Hits High of 86,225,469 Tons

Cleveland

• • • **The completion of** blast furnaces during 1943 that are now under construction will place a heavy strain on raw material supplies, especially iron ore. While WPB set an all-time-high quota for downlake ore deliveries for 1943 at 104,000,000 gross tons, in view of the fact that consumption last year in the United States alone was 83,714,451 tons with another 2,511,018 tons going to Canada, these estimated requirements for the coming year are, if anything, on the low side of what will be actually needed.

Stacks now under construction are shown in the accompanying table; that is, furnaces that will be dependent completely or to a large extent on lake ores:

Company	Location
Inland Steel Corp.	Chicago
Inland Steel Corp.	Chicago
Carnegie-Illinois Steel Corp.	Pittsburgh
Carnegie-Illinois Steel Corp.	Pittsburgh
Pittsburgh Steel Corp.	Pittsburgh
Bethlehem Steel Corp.	Lackawanna, N. Y.
Bethlehem Steel Corp.	Bethlehem, Pa.
Republic Steel Corp.	Cleveland
Republic Steel Corp.	Chicago
*American Steel & Wire Co.	Duluth
**Algoma Steel Corp., Ltd.	

*Joliet furnace moved to Duluth.
**Canadian producer.

In addition to these new furnaces, many now in operation have been or will be enlarged. Consequently, with blast furnace operations continuing at present high levels during the coming 12-month period and the new units coming into blast, the 104,000,000 gross ton quota for iron ore will not be in excess of needs.

Iron ore consumed by blast furnace and steel making operations during December hit a new high of 7,759,366 gross tons, according to the statistics of the Lake Superior Iron Ore Association. Of this quantity, 7,540,841 tons went to consumers in the United States and 218,525 tons were required by Canadian mills. November consumption amounted to 7,455,778 tons. Stocks were reduced quite sharply during the month. At U. S. furnaces on Jan. 1 there were 39,277,113 gross tons of ore stocks while 1,326,437 tons were stocked at Canadian furnaces. On Lake Erie docks, 6,820,871 tons were on hand, bringing the total reserves at the mills and on the docks to 47,424,421 gross tons. On Dec. 1, 1942, there were 53,703,458 tons of ore stocked.

Part-time Night Workers Given a Free Hot Supper

• • • **American Bosch Corp.**, Springfield, Mass., has adopted a new policy of hiring part-time employees who will work from 6 to 9 p.m. from Monday to Friday nights, inclusive. Everything will be done to make such work practical even to the extent of providing workers on this shift with a hot supper free of charge.

WLB Grants Pay Boost To 1400 Pittsburgh Workers

Washington

• • • **Applying its** "Little Steel" formula, the National War Labor Board on Monday announced a wage increase of 5½c. an hr. to approximately 1400 employees of the Oliver Iron & Steel Corp., Pittsburgh. The increase was made retroactive.

PRESSED COLD by PARISH In 4000 ton Press

The method best suited for each particular stamping—to insure most effective results, most efficient production and most modest cost—is employed when you present your problems to the Parish plant.

Equipped to handle all types of work in all methods and sizes of stamping, our plant is able to meet your specifications in all its elements, including the factor of time.

Illustrated is a Spring Plank for railroad freight car trucks. Made of 7/16" metal—16⅝" wide at ends, 14¼" wide at center and 93¼" long with flanges 3⅜" high at center, 2 3/16" high at ends—it was pressed cold from heavy steel.

The submission of your requirements for review involves you in no obligation.

PARISH
PRESSED STEEL CO.
READING, PENNA.

Pacific Coast Representative
F. Somers Peterson Co.,
57 California St.,
San Francisco, California

We have turned our facilities over entirely to the manufacture of various products required by the United States Government and American Railroads.

48-HOUR DELIVERY . . .

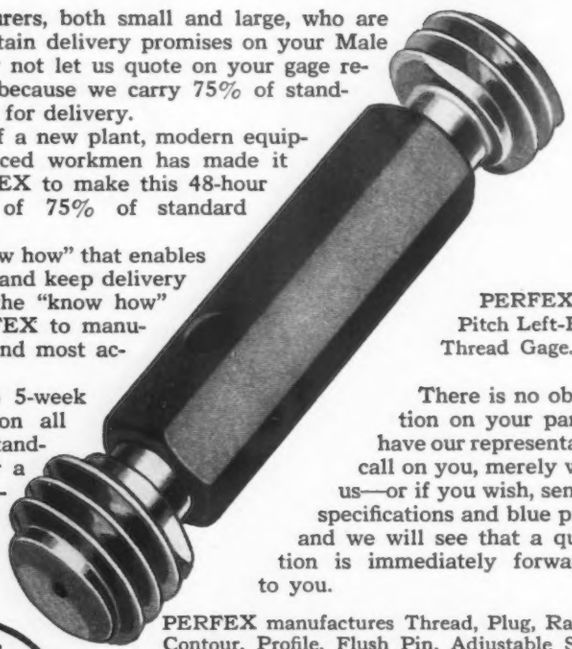
. . on 75% of standard MALE THREAD GAGES!

For you manufacturers, both small and large, who are worried over uncertain delivery promises on your Male Thread Gages, why not let us quote on your gage requirements today, because we carry 75% of standards in stock ready for delivery.

A combination of a new plant, modern equipment and experienced workmen has made it possible for PERFEX to make this 48-hour delivery promise of 75% of standard male thread gages.

Yes, it's the "know how" that enables PERFEX to make and keep delivery promises and it's the "know how" that enables PERFEX to manufacture the finest and most accurate gages.

There is a 3 to 5-week delivery promise on all other PERFEX standard size gages. For a complete description of our gage line wire or write our sales department today!



PERFEX'S 4 Pitch Left-Hand Thread Gage.

There is no obligation on your part to have our representative call on you, merely write us—or if you wish, send us specifications and blue prints and we will see that a quotation is immediately forwarded to you.

PERFEX manufactures Thread, Plug, Radius, Contour, Profile, Flush Pin, Adjustable Snap, Solid Snap, etc.

ACCURACY PERFEX OUR CREED

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3609 GAYLORD DETROIT, MICHIGAN

LET US QUOTE ON YOUR GAGE REQUIREMENTS!
Send this today!

Perfex Gage & Tool Company
3609 Gaylord Avenue, Detroit, Michigan

Gentlemen:

Enclosed find specifications and blue prints to quote on our gage requirements. We understand that there is no obligation on our part.

NAME_____ POSITION_____

COMPANY_____

ADDRESS_____

Canada to Function Under Modified Form Of CMP on U.S. Metals

Toronto

• • • **A new modified** Controlled Materials Plan has been introduced and will go into effect immediately in Canada. Under this plan, manufacturers, basic producers, and public utilities which have purchased from the United States during the last three months of 1942, or intend to purchase during the second quarter of 1943, critical materials or parts containing such metals, worth a total of $2500 or more in purchase value, must file before Feb. 10, a new form, to be known as PB-1005.

This new form is substantially simpler than that used by industry under PRP. It must be filed by all firms coming under the new definition of a "Class 1 Consumer".

Under the new regulations, a Canadian "Class 1 Consumer" means any person (or any branch, plant, department, or other division of a corporation or business) whose imports from the United States, either direct or through a Canadian agent or distributor, during the most recent calendar quarter or whose anticipated requirements from the United States during the current or next succeeding calendar quarter, or metals included in the CMP Materials List or article containing such metals (excluding capital equipment) aggregate $2500 or more in purchase value: except any person to the extent that he is engaged in the business of the sale of materials which he has not manufactured, processed, fabricated, assembled, or otherwise physically changed, including sales as a distributor, wholesaler, retailer, warehouse, industrial or mill supply house, or scrap dealer. For the purpose of this definition, the foregoing exceptions shall not apply to the operation of a steel warehouse.

•

L-217 Limits Alloy Steel

• • • **The use of alloy** steel in angledozers or trailbuilders, in bulldozers, and in repair parts for both of these construction equipment items, is prohibited after Feb. 1, by Limitation Order L-217, schedules III and IV, issued Jan. 23 by WPB.

Power control units, prime mov-

ers, and anti-friction bearings are exempted from the denial of the use of alloy steel in both schedules. Producers may also use such alloy steel as is in inventory or in transit to them on Feb. 1.

•

Valve Styles Cut

• • • **The number of types** of gate, globe, angle, cross, and check valves now produced will be reduced from 4079 to 2504 under limitation order L-252 issued Jan. 23 by the WPB. The order is effective immediately. Because many of the valves used on ships must meet special conditions, they are not covered by the order. Valves ordered for ship construction approximate 45 per cent of those produced.

•

Order L-170 Revised

Washington

• • • **WPB has made** several changes in Order L-170 which limits the manufacture and distribution of farm machinery. The changes with respect to manufacture are as follows:

Weight of materials in silo construction governs quotas now rather than the number of units to be constructed. The quota percentage for silo construction has been increased from 12 to 16 per cent.

Water pump cylinders are designed as repair parts, permitting cylinders to come within the 130 per cent quota for repair parts.

Grain bins and corn cribs when made from material other than steel are excluded from the definition of farm machinery and equipment and are no longer covered by the order.

Harness hardware is added to horseshoes, muleshoes and horseshoe nails as an item excluded from the restrictions limiting them to use on farms.

Tractor mounted field cultivators, tillers and tooth weeders are added to Schedule A.

Combination stacker-loaders are separated from the stationary type of stacker. Class C producers of combination stacker-loaders are given a 75 per cent quota.

Milk pails and strainers are added to Schedule A as bracketed items and assigned 36 per cent and 75 per cent quotas, respectively, to Class B and Class C producers.

•

Regulation Simplified

Washington

• • • **An amendment** to WPB Priorities Regulation No. 9 and revocation of Preference Rating Order P-98-d, both of which affected oil operators applying for priority assistance for materials sent to foreign countries, were ordered last Wednesday by WPB.

Under the amendment, oil operators will use only Form PD-311 or PD-311C, whichever is applicable, to apply for materials to be used in foreign countries as maintenance, repair, and operating supplies and production equipment.

Ratings will be assigned by WPB, or, in the case of some products, by BEW, acting under General Exports Order M-148, as amended.

•

Bismuth under Control

• • • **Metallic** bismuth was put under complete allocation and use control Jan. 19 by Conservation Order M-276. It is effective Feb. 1. Use of bismuth in consumer inventories is likewise controlled, and not more than 50 lb. per month may be used without authorization.

This Week's Priorities and Prices

Conditions governing application of maximum prices to lump-sum and average price bids and contracts for furnishing fabricated steel bars used to reinforce structures of concrete are defined under Maximum Price Regulation No. 159, Amendment No. 2. (OPA-1498)

Freight on iron and steel pipe from mill basing point to buyers location is included in maximum prices for these products and under the formula for determining prices is subject to a percentage mark-up, according to Revised Price Schedule No. 49. (OPA-1493)

Allotment of steel for the manufacture of farm machinery has been increased and a priority of AA-1 is assigned to delivery of the steel. (WPB-2388)

Instruments for measuring, testing, recording and indicating and other precision devices, which are motivated by electricity but do not measure electrical quantity, were placed under Maximum Price Regulation No. 136, by Amendment No. 67. (OPA-T-515)

Use of alloy steel in construction machinery is prohibited after Feb. 1 by Order L-217, Schedules III and IV, issued Jan. 23. (WPB-T-1639)

Types and sizes of valves to be produced have been reduced nearly one half under Order L-252, issued Jan. 23. (WPB-T-1635)

Nonferrous castings made by foundries doing less than $50,000 a year were removed from price control and certain reductions were made in maximum prices to reflect lower metal costs. Base periods were extended. The move was a revision to MPR 125 effective Jan. 27.

Second-hand steel shapes were placed under a maximum price of 2.75c. lb. f.o.b. shipping point on a nationwide basis. Extra charges were set at a ceiling of ¼c. lb.

■ ■ ■

For copies of above announcements address Office of War Information, Washington, giving announcement number as shown in parentheses after each paragraph. (For example, WPB-600 means announcement 600 issued by the War Production Board.)

Revisions to The Iron Age Priorities Guide

• • • The following data, together with all intermediate weekly revisions in THE IRON AGE, should be added to THE IRON AGE Priorities Guide published with the issue of October 8 to bring the Guide up to date.

Priority Regulations:

No. 9...Amendment (1-20-43) requires use of only Form PD-311 or PD-311 C in applying for priority assistance for materials to be used in foreign countries.

"M" Orders:

M-9-c...Amendment (1-18-43) corrects error appearing in Amendment No. 1, issued Dec. 26.

M-9-c...Amended order requires engravers to sell as scrap a specific quantity of old copper engraving plates (1-21-43).

M-261...Restricts use of iron, steel or other metal wire or bands to use on certain types of packaging (1-25-43).

M-276...Order places metallic bismuth under complete allocation and use control (1-19-43).

"P" Orders:

P-68...Amendment (1-19-43) permits use of AA-1 rating to small producers of iron and steel.

P-98-d...Revoked (1-20-43).

P-126...Amended order assigns higher preference ratings for emergency repair of refrigerators and cooling systems (1-21-43).

"L" Orders:

L-39...Amended order tightens control over production and sale of fire extinguishers (1-22-43).

L-170...Amended order modifies several restrictions on the manufacture and distribution of farm machinery and equipment (1-19-43).

L-217...Schedules III and IV (1-23-43) limit use of alloy steel in construction machinery.

L-252...Order reduces types and sizes of valves to be produced (1-23-43).

CMP . . Current Thinking Explained About

Washington

• • • **CMP is experiencing** growing pains. Since the original announcement of the plan, WPB and industry have been hammering into shape the final form the plan will take. Its growing pains have included constructive criticism from WPB and industry alike. But, since it is due to replace PRP as it has been known, the PRP proponents have been attempting to get as many as possible of the PRP features incorporated in the plan.

This article represents current thinking about such CMP phases as the transition from PRP to CMP, integration of WPB orders into PRP, warehouses and inventory control. The policies presented in connection with these subjects are subject to change and are not to be considered as final.

It is expected that Priorities Regulation No. 11 will be amended so that second quarter PD-25A's will be filed. That is, no Class I producer (one who has a contract for a military end product or a contract that can be identified with a war order) will have to file one for the second quarter, or thereafter, and no person who becomes a Class I producer after Jan. 1 is required to file a PRP application for first quarter of 1943.

Ratings Apply to Part of Needs

UNDER Priorities Regulation No. 11, as it may be amended, authorizations for production materials will be handled through the granting of CMP allotments. In the applications may be included requests for both controlled and non-controlled materials. Quantities authorized under CMP allotments may be deducted from any quantities authorized under PRP.

Each PRP unit may apply the production material ratings authorized for the first quarter of 1943 to not more than 70 per cent of the quantities of the listed materials in Section E for production to which it was permitted to apply ratings by the first quarter PD-25A plus PRP interim application certificates issued on or before Feb. 28.

In arriving at quantities to which the 70 per cent is to be applied, there must be deducted any quantities of material to which a first quarter authorized rating was applied for maintenance, repair and operating supplies. The 70 per cent authorization is to be scheduled for delivery to the PRP unit at the rate of not more than 40 per cent for the first month and 70 per cent for the quarter. This general authorization may be modified for particular products or particular industries by a letter over the Director General's signature, authorizing a different percentage.

After March 31 each PRP unit which has not been specifically advised otherwise will be authorized to apply ratings to and to receive the remaining 30 per cent of the listed production materials to which it was authorized to apply ratings by first quarter PD-25A plus PRP interim certificates issued before Feb. 28.

The quantity of material which a PRP unit is authorized to apply a rating under CMP must be deducted from the quantities to which it is authorized to apply a rating under this provision. If CMP allotments exceed the amount authorized under PRP, the PRP unit may receive the additional amount covered by CMP allotments.

PD-25F May Be Filed

IF a purchase order has been placed and a rating under PRP applied and the PRP unit subsequently wishes to use the CMP rating for the quantities of material authorized under CMP, then if more than one rating has been authorized under PRP, the PRP rating for the particular product nearest to the CMP rating, must be cancelled.

The idea now is to permit a PRP unit to receive quantities of aluminum, copper and alloy steel in excess of the quantities permitted under PRP to the extent such excess quantities are approved for delivery to the PRP unit by the appropriate materials division, as provided in the authorization section of the PD-25A certificate for the first quarter.

However, a PRP unit may apply ratings for aluminum, copper and alloy steel only to the quantities authorized on its PRP certificates or in accordance with the foregoing procedure. In the case of aluminum, a PRP unit is authorized to apply ratings during second quarter as provided by the foregoing procedure, to 70 per cent of the quantities stated as to its requirements for the first quarter.

Increased in a program for the second quarter should in general be accomplished through CMP allotments, but PD-25F applications may be filed for increased authorizations by PRP units.

Each PRP unit is authorized to apply preference ratings authorized during the first quarter to all production materials other than listed materials in Section E, but only in the approved quantities and at the rate necessary.

A CMP regulation will be issued outlining the method for companies in general to procure maintenance, repair and operating supplies. Until that time, PRP units are authorized to procure these supplies as they did in first quarter of 1943. When issued, the CMP regulation will supersede all PRP authorizations.

A PRP unit which showed more than one class of product its PRP application for first quarter will be required to schedule these products for production during the second quarter in substantially the same proportion as was permitted by its first quarter authorization except as this may be modified by CMP authorizations or by special authorization of the Director General.

L and M Orders May Be Eased

NOT all restrictions of existing L and M orders will remain in effect.

However, many of the outstanding WPB orders, in one or more respects, are in conflict with CMP because these orders were developed when preference ratings controlled materials, rather than distribution by allotment. Orders which restrict manufacture, so far as controlled materials are concerned may be modified in favor of production control by allotments subject to the provision of CPM Regulation No. 1 which reads as follows:

"Nothing in this regulation (or any other CMP Regulation) shall be construed to relieve any person from complying with any applicable priorities regulation or any order of the War Production Board (including orders in the 'E', 'L', 'M', and 'P' series) except as expressly provided, or except where such compliance would require violation of a provision of this regulation." (Or any other CMP Regulation.)

It is also provided that every allot-

Material in Shapes May Become Class A

• • • Here's a suggestion from the New York regional office of WPB:

Materials that you buy which have been fabricated beyond the mill shapes may be CMP Class A products. If so, it will be necessary for you to include on your CMP-4B applications the material in mill shapes which manufacturers need to make the item you buy from them.

Consult the Class B list. If the item does not appear upon this list, it is a Class A item.

Transition From PRP to CMP . . .

ment of controlled material must be accompanied by an authorized production schedule for both Class A and B products. Furthermore, each consumer who receives an authorized production schedule, must fulfill his schedule and not exceed it.

It can be seen, therefore, that the regulation appears to expressly take precedence over "L" orders providing manufacturing quotas. It is not considered necessary to eliminate quota restrictions, but some WPB officials think it should be done to avoid confusion. In the absence of allotments and authorized production schedules, and for products not classified as A or B, "L" and "M" orders will govern.

In short, quota restrictions during the transition period may be gradually eliminated. Preference rating restrictions on the manufacture and sale of products containing controlled material may be eliminated during the transition period, while such restrictions will continue for non-controlled materials.

IN connection with the elimination of preference rating restrictions on the manufacture and sale of products containing controlled materials, it has been recommended that CMP be amended as follows:

"Any delivery order for a Class A or Class B product, within quantities for which an allotment has been made, and a production schedule authorized, may be produced and sold regardless of preference rating limitations of 'L' and 'M' orders."

These preference rating limitations (Orders that prohibit sale or fabrication except to fill delivery orders bearing a preference rating above a specified grade) will control production and sale of any Class A and Class B product for which no production schedule has been authorized; and, will control the fabrication of any product other than Class A or Class B.

The basis for this change lies in CMP itself. CMP contemplates that all material parts and subassemblies be made available to complete authorized programs and authorized production schedules. After April 1, delivery orders for Class A and B products will be placed partly on the basis of allotments and approved production schedules, and, partly as authorized on extensions of 1st quarter PRP certificates.

Inventory Rule Likely

IN prohibiting sale and fabrication at lower than specified ratings, these "L" and "M" orders have frozen certain inventories of critical materials.

These inventories are being utilized in war production as rapidly as possible. As allotments of controlled materials will be issued in broad product classifications, under the proposed revisions, manufacturers without allotment could employ highly critical materials frozen in their inventories, even though WPB requires use of less critical materials. For example, Order M-21-d prohibits fabrication of stainless steel, except to fill delivery orders rated AA-5 or higher. Because of M-21-d, many manufacturers have frozen stocks of stainless steels which might be dissipated in unauthorized uses unless the following provision is also considered in amending preference rating restrictions in "L" and "M" orders:

Any controlled material in a consumer's inventory, which was frozen by preference rating restrictions of "L" and "M" orders, prior to April 1, may not be used except by specific permission of the Director General for Operations, or, under an allotment authorizing the use of the specific items of frozen inventory.

While CMP provides that delivery of controlled materials will not be affected by any preference rating including AAA, it does provide that Controlled Material Divisions may issue special directives to effect the emergency production and delivery of individual orders bearing allotment numbers.

Controlled materials divisions also have the responsibility and authority for balancing production and requirements of controlled materials. Detailed scheduling of the production of individual purchase orders may not be required for most classes and forms of controlled materials. However, in other materials like alloy steel, the critical situation demands detailed scheduling of production and shipments, at least during the transition period when scheduling will be continued substantially as in the past.

Many non-controlled materials such as pig iron and magnesium are under complete allocation. The methods for distributing these materials will not require significant change.

Warehouse Plan Coming

A WAREHOUSE plan is being devised to fit in with CMP policies. It will establish controls for diverting controlled materials through warehouses, for resale, and inventory regulations.

It is the intention of each controlled materials division to provide for adequate warehouse stocks by April 1. Because it will not be possible to rebuild each warehouse inventory by April 1, the controlled materials divisions intends to issue purchase authorizations to each warehouse handling general products to cover the specific tonnage which may be ordered for delivery during the second quarter. Purchase orders presently outstanding in excess of the amount authorized for the second quarter will have to be cancelled by each warehouse.

A form tentatively has been devised to enable warehouses to replenish stocks without making specific application to do so. Beginning, April 1 it is planned that stock replacements of controlled materials will be accomplished only by the accumulation and extension on the form of previous deliveries on allotment numbers, and of approved deliveries without allotment numbers. If no deliveries are made, the warehouse will not be entitled to order any controlled materials during a succeeding quarter. When ordering general products the warehouse will be permitted to add to the weight of previous deliveries certified on the form a small percentage to cover actual scrap loss. No allowance for scrap loss will be permitted when ordering copper, aluminum, or alloy steel products.

Because of the large number of merchant trade steel warehouses, it is impractical for WPB to issue individual purchase authorizations. Ac-

(CONCLUDED ON PAGE 106)

File CMP Forms Soon, Allotments Will Help

Washington

• • • In an effort to get in the CMP forms by Feb. 9, Director Harold Boeschenstein stated that manufacturers holding allotment numbers in addition to preference rating will have a definite advantage in obtaining material for second quarter production. Those who meet the time schedule for the forms will get allotment numbers which will give their orders precedence over preference rated orders. Manufacturers who have been requested to furnish Bills of Material must also send in their requests for allotment numbers, he warned. The forms which must be filed by Feb. 9 according to schedule are CMP-4A and CMP-4B.

PERSONALS

• **D. U. Bathrick,** who until June 8 when he was called to Washington, was general sales manager of the Pontiac Motor Division, will assume charge of the Washington office of the General Motors Corp. He succeeds **R. H. Grant,** vice-president of General Motors, who is returning to Detroit.

• **B. DeLorenzo** has been named manager of the heat transfer department of the Brown Firetube Co., Elyria, Ohio.

• **J. Clark Samuel,** for the past two years director of publicity for Anderson, Davis & Platte, Inc., New York, has joined the Rustless Iron & Steel Corp. of Baltimore as editor of employee information.

• **William B. Stout,** inventor and engineer of Detroit, together with his entire laboratory organization, have joined Consolidated Aircraft Corp. at San Diego.

• **Robert E. Gross,** president of Lockheed Aircraft Corp., Los Angeles, has been elected president of the Aircraft War Production Council, Inc., succeeding **Harry Woodhead,** president of Consolidated Aircraft Corp., whose term has expired.

• **Edward C. Wells,** assistant chief engineer of the Boeing Aircraft Co., has received the Lawrence Sperry award for 1942 for notable accomplishments by young men in the advancement of aeronautics. Mr. Wells is 32 years old and has been with Boeing for 12 years. He is responsible for much of the design and engineering work on the B-17 Flying Fortress Army bombers.

• **John E. Wright,** formerly with the American Steel Foundries, has been appointed regional sales manager, railway division, of the Edward G. Budd Mfg. Co., and will be in charge of the new St. Louis office.

• **David S. Stoker,** formerly associated with the Allison Engineering Co., has been named to the research staff of Battelle Memorial Institute, Columbus, Ohio, and has been assigned to its division of analytical chemistry.

• **Leonard T. Blaisdell,** General Electric commercial vice-president at Cleveland, Ohio, was given an honorary degree of electrical engineer at the winter graduation of the Case School of Applied Science in recognition of his "long and distinguished professional record."

• **David Sloan,** a veteran machine specialist, retired for 10 years, has been recalled to active duty at the Lynn River Works of the General Electric Co. to instruct new workers in the operation of automatic screw machines.

• **George G. Hathaway** has resigned as sales manager of the International Machine Tool Corp. **Harry W. Heidergott** will take over the duties of sales manager.

• **Col. John C. Minor** has been granted a leave of absence by the Taylor-Wharton Iron & Steel Co. and has accepted a position as consultant on gas cylinders with the WPB.

• **Malcolm Farmer** has resigned as director and executive vice-president of the Phoenix Iron Co., Phoenixville, Pa.

• **L. F. Skutt,** with Nash-Kelvinator Corp. since August, 1942, has been named general sales manager of the Nash Motors Division. Mr. Skutt, whose vocation is aeronautical engineering and whose avocation is designing and flying planes was introduced as the 38th president of the Society of Automotive Engineers. Mr. Short was instrumental in forming the Stearman Aircraft Co., of Wichita, Kans., and for 10 years was vice-president and chief engineer. In 1937 he organized and became president of Vega Aircraft Corp. He relinquished administrative duties in 1940.

• **John D. Tyson** has been appointed manager of sales and metallurgy, Baldwin Locomotive Works, with headquarters at Burnham, Pa., new location of the home office sales department. Mr. Tyson will be assisted in his new position by **Gifford W. Thompson** as manager of home office sales section. **Geo. S. Baldwin,** formerly superintendent of the open hearth, has been appointed chief metallurgist of Standard Steel Works Division, reporting to Mr. Tyson.

• **Fred B. Loveland** has been made assistant general superintendent, Youngstown District plants of Carnegie-Illinois Steel Corp.

• **Clarence C. Wehling** has been appointed district sales manager at Pittsburgh for Jones & Laughlin Steel Corp. Since June, 1942, he has been assistant district sales manager. **R. C. Garvey** has been appointed district sales manager at San Francisco. He succeeds **C. P. Hensley,** who has retired after many years of service. **E. S. Holden** has been appointed resident manager at the Denver Sales Office, succeeding the late H. H. Galbraith.

RONALD R. MONROE, president, J. G. Brill Co., Philadelphia.

• **M. L. Briggs** has resigned as vice-president of the Briggs Mfg. Co. He will join the real estate department of the Briggs Commercial Development Co., Detroit.

• **E. W. Husemann,** formerly with Republic Steel Co. at Chicago, has been named metallurgist in the Copperweld Steel Co.'s metallurgical department, Warren, Ohio.

• **J. Edwin Doyle** has been appointed assistant to the manager in charge of labor relations at General Electric's Lynn River Works.

• **Bennett S. Chapple, Jr.,** heretofore assistant to the vice-president, operations, in charge of emergency defense coordination, has been made assistant manager of sales of the New York district sales office of the Carnegie-Illinois Steel Corp. He is succeeded by **Ross L. Leffler,** who, in addition to his duties as special representative, will coordinate emergency defense measures in the company

and cooperate with public authorities and defense agencies.

• **R. C. Wietersen** has been appointed director of purchases for the Buda Co., Harvey, Ill. For the past two years he was director of purchases for the National Supply Co., Springfield, Ohio.

• **John H. Romann,** chief metallurgist of Tube Turns, Louisville, Ky., manufacturers of welding fittings and special forgings, has been appointed chairman of a committee to conduct a special nation-wide investigation in industrial plants concerning the low temperature properties of metals. This research is being carried on for the War Department by the War Metallurgy Committee of the National Research Council, National Academy of Sciences, Washington.

• **David W. Hopkins,** secretary and director of the R-S Products Corp., Wayne Junction, Philadelphia, for a number of years, has been elected vice-president.

• **James B. McIntyre** has been appointed district manager of the Baltimore operations of the United States Steel Supply Co., formerly Scully Steel Products Co. **Joseph D. Boan** has been made assistant district manager and **Charles D. Surette, Jr.,** manager of the Boston sales office.

• **J. W. Belanger** has been named manager of General Electric's federal and marine department. Mr. Belanger succeeds **D. W. Niven,** manager since 1921, who will continue as a member of the department available for consultation and special duties.

• **R. G. Boyd,** now manager of planning and scheduling in the tire division of B. F. Goodrich Co., has been assigned to the allocation division of the War Production Board. He joined B. F. Goodrich in 1927 shortly after his graduation from the United States Naval Academy. After several years in the technical service division he was assigned to foreign service by the company, returning to Akron from France in 1939.

• **R. J. Hull,** who will serve on the staff of the Rubber Administrator, is assistant manager of compounding in the tire division of B. F. Goodrich Co. He came to B. F. Goodrich in 1927 after graduating from Purdue University. After experience in the company's general chemical laboratories he was transferred to the tire division as a compounder.

• **Leslie E. Hess** has been elected chairman of the board of the J. G. Brill Co. to succeed Charles J. Hardy, who will continue as chairman of the executive committee **Ronald R. Monroe,** vice-president, succeeds Mr. Hess as president.

• **John Votypka** has been appointed to the War Production Board's Detroit regional staff as head industrial specialist of the Production Service and Smaller War Plants divisions. In recent years he was director of engineering for Fruehauf Trailer Co. and prior to that was with Briggs Mfg. Co. for 14 years.

• **W. G. Paton,** assistant to the general manager, and W. R. Engstrom, Seattle district manager, have been made vice-presidents of the Austin Co., Cleveland. In addition to his election as a vice-president, Mr. Paton also will assume the posts of assistant secretary and assistant treasurer of company.

• **K. C. Gardner,** vice-president, United Engineering & Foundry Co., Pittsburgh, has been appointed to the additional office of general manager of the company. Mr. Gardner has been associated with United Engineering since 1901, has been a director since 1911 and vice-president since 1928.

• **Edwin Olney Jones** has been elected a vice-president of the Federal-Mogul Corp., Detroit. Mr. Jones, who continues as sales manager of the company's original equipment division, has been associated with Federal-Mogul since the corporation's organization in 1924 and a director since 1929. **Guy S. Peppiatt** has been named executive assistant to the president, H. Gray Muzzy.

• **Ernest Jones,** former general superintendent of the Sorel Industries, steel producers of Quebec, Canada, has joined the Isaacson Iron Works as head of the steel melting department of Plant No. 2 in South Seattle.

• **Ralph E. Kramer** has been appointed general manager of Suprex Gage Co., Ferndale, Mich. Mr. Kramer formerly was president of H. Channon Co., Chicago. He is also currently vice-president of the National Association of Supply and Machinery Distributors.

OBITUARY . . .

• **Henry C. Pierle,** secretary and general sales manager of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, died Jan. 14. He was 62 years old.

• **Don C. O'Brien,** salesman in the Indianapolis office of the American Rolling Mill Co., was instantly killed in an automobile accident on Jan. 14. His car collided with a truck in Indianapolis. He was 37 years of age and had been associated with Armco for more than 14 years.

• **L. E. Greer,** superintendent of the Thomas Foundries, Inc., Birmingham, for about 20 years, died at Birmingham Jan. 12, aged 65 years.

• **Alfred C. Johnson,** veteran maintenance official of the Ford River Rouge plant, died recently. He entered the employ of Ford Motor Co. in 1904 and in the first World War was in charge of Detroit ordnance plants operated by Ford.

• **John J. Milliken,** for 20 years sales representative of the Boston steel firm of Spang-Chalfant, Inc., died suddenly Jan. 15. He was 46 years old.

• **Harris T. Dunbar,** one of the founders of the Buffalo Foundry & Machine Co. and vice-president of the David Bell Co., manufacturers of automatic screw machines, died Jan. 15, aged 77 years.

• **Alexander E. Martin,** president of the A. E. Martin Foundry Co., Milwaukee, until his retirement several years ago, died Jan. 10 after a long illness.

• **Edgar Palmer,** chairman of the board, New Jersey Zinc Co., died Jan. 8, aged 62 years.

• **L. S. Thomson** of the general sales department of the Alan Wood Steel Co., Conshohocken, died suddenly Jan. 6. He had been with Alan Wood about 15 years.

MACHINE TOOLS

. . . Sales, Inquiries and Market News

Backlogs Decline in Face of Fresh Buying

Cincinnati

• • • **A modest improvement** in demand for machine tools during the past week has brought a little better balance between incoming business and cancellations. Despite this modest improvement, manufacturers still indicate a very substantial amount of revocation of business previously placed. The entire situation has stimulated interest in developing new lines for post-war use as well as an attempt to fill in gaps when the present brisk business is completed. A number of plants are working their designing, drafting and experimental departments at a very high rate in an effort to develop new lines to meet the changed conditions. Plants continue to operate at full capacity and are eating into backlogs at a fairly good rate although the demand and backlogs are still substantial and will continue to sustain the present capacity operations well into the summer and in some instances beyond.

Clearing House Planned For Idle Welding Equipment

Washington

• • • **Resistance welding** equipment, more than 8000 units, formerly used in peace time by the automotive, refrigerating, washing machine industries will be made available to war industries by WPB it was announced recently. A clearing house will be set up to be under the jurisdiction of the General Industrial Equipment Division of the Resistance Welding Unit and the WPB Materials Redistribution Division.

The redistribution of the equipment will have the effect of reducing order backlogs for welders, save many labor materials, and speed war production because the lack of equipment threatens to hold up production schedules on some of the most essential war contracts.

All idle equipment that can be used should be restored to service and all other machines will be scrapped. This was agreed to by the Resistance Welding Industry Advisory Committee.

Electronic Controlled Drive for Machine Tools

• • • **How a General Electric** electronic variable-speed drive called the Thy-mo-trol not only saves time and material but also helps to increase the amount and kinds of work that can be done on various machines, was described recently at a meeting of the American Society of Tool Engineers at Boston, by S. D. Fendley, G-E electronic engineer.

The Thy-mo-trol system employs electronic tubes to convert a. c. to controlled d. c., and provides variable armature and field voltages for operating a d. c. motor from an a. c. power line. The equipment not only provides wide-range speed control but performs the additional functions of starting, accelerating, protecting and stopping motors with ratings up to 5 hp. and 230 volts.

Mr. Fendley mentioned instances where the wide speed range of this system has enabled machines to produce more kinds of work and in altogether greater volume. He mentioned another instance where the ability of the equipment to maintain full-load motor torque, even when operated at low speed, made it possible for a machine builder to simplify materially the headstock of his machine. In still another instance, the speaker said, installation of the Thy-mo-trol drive, with its smooth acceleration and its ability to operate at low speeds, resulted in materially adding to production by increasing the number of pieces turned out by cutters between grinds.

Mr. Fendley pointed out that the adjustable limit feature of the Thy-mo-trol drive makes it possible to limit the motor torque to a predetermined safe value. Overloading the machine beyond safe limits is thereby prevented, as is the possibility of subjecting the gears to undue shock during acceleration.

CMP

(CONCLUDED FROM PAGE 103)

cordingly, each producer of these products will be directed to deliver to each warehouse quarterly to whom such products were delivered during 1940 a percentage of the tonnage so delivered.

It is not contemplated to further implement CMP Regulation No. 2, covering inventories. The regulation establishes a general inventory limitation of 60 days. Provision is made, however, for the Director General for Operations to authorize exceptions to this limitation. Acceptance of deliveries is prohibited if the users' inventories would be increased beyond the established limits.

Inventory limits may be exceeded under the following four conditions:

When a producer makes delivery prior to the specified date in accordance with CMP Regulation No. 1.

When a supplier has shipped or loaded for shipment before receipt of notice to reduce, postpone or cancel order.

When delivery would be less than minimum weights specified in Schedule A or CMP Regulation No. 2.

When delivery involves special specifications and cannot be readily disposed of by producer.

The regulation provides for the redistribution of excessive inventories, includes the usual appeals clause, and requires that users of controlled materials, including Governmental agencies, file inventory reports on form CMP 7. Under CMP inventories will be reported on this form, which, at the start, will be sent to about 10,000 or 12,000 of the largest consumers who use approximately 90 per cent of the total controlled materials. No person should file CMP 7 until specifically requested by the Director General for Operations. Producers and distributers of controlled materials in the forms and shapes listed on CMP 7 are not required to report such portions of their inventories which are sold or held for sale. Similarly, persons specifically exempted by WPB or located outside of continental United States are not required to file form CMP 7.

Specific information required on form CMP 7 follows:

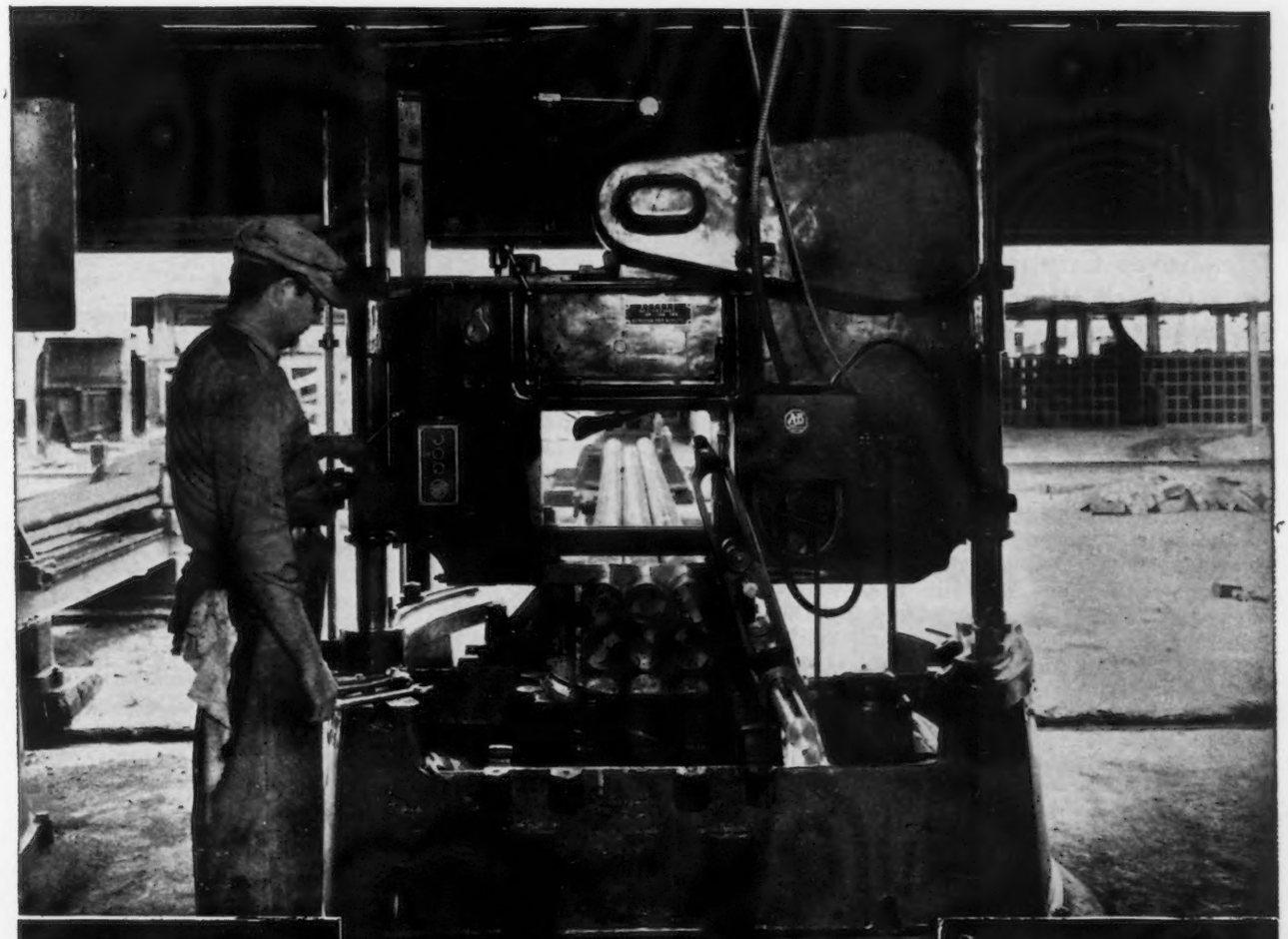
List all Class "A" and "B" products manufactured by each reporting unit.

Check list of controlled materials used in each product to assist analysts in quickly relating inventory data to class of product.

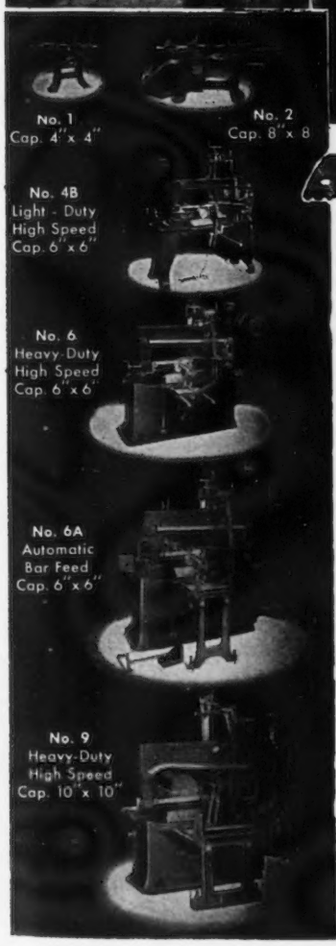
Unit shipments of each Class "A" and "B" product to compare trends of shipments and inventory.

Value of shipments by Claimant Agencies in order to place responsibility on particular Claimant Agencies and as the basis for diverting excessive stocks to other manufacturers.

Classification of past usage, inventory, anticipated receipts, and estimated requirements for materials as shown on form CMP 7.



MARVEL SAWS



Cut anything that will go between the jaws

This is one of five No. 18 MARVEL Giant Hydraulic Hack Saws used by a well known Texas tool company to cut-off "multiple bars of alloy steel in round, square, and flat shapes, up to the maximum capacity of the large work-throat (18" x 18")".

These super hack saws are designed for the largest sizes, and toughest steels—up to 18" x 18". After a year's heavy duty service, when asked as to the effectiveness of these saws in solving the cutting-off problems at this plant, the mechanical engineer in charge reported them "very effective."

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave.
Chicago, U. S. A.

Eastern Sales Office:
225 Lafayette St., New York

NON-FERROUS METALS

. . . **Market Activities and Price Trends**

Specifications Chart Saves Copper and Tin

• • • **A guide for engineers** and designers to make use of lower grades of critical material for brass and bronze castings has been issued by the Specifications Branch of the WPB Conservation Division.

Before formulating the down-grading chart, Carter S. Cole, chief of the Metals Section of the Specifications Branch, explained specifications had been carefully reviewed by Army, Navy and Federal Specification Committees, the ASTM, SAE and many of the companies that write their own specifications. In liberalizing specifications, requirements for virgin metal have been removed, impurity limits have been raised and specifications for new alloys written so that material currently available can be used to better advantage.

"The chart," Mr. Cole went on, "shows most of the important specifications grouped in columns according to the material required by an ingot maker or foundryman. Four classifications are given. 'All New Metal' includes No. 1 and No. 2 copper as well as electrolytic. 'High Purity Secondary' is exemplified by such items as fired cartridge cases, currently used to make regular manganese bronze. Where lead is equal to or greater than the amount of tin, the tin content of bronzes can generally be introduced into the alloy from secondary sources.

"In many instances Composition 'M', or even 85-5-5-5 will give adequate service performances for many items where Composition 'G' has been specified. The Armed Services are recognizing this and have made many such specification changes to conserve primary metal. The Navy, for instance, last spring, issued a directive permitting the use of Composition 'M' in place of 'G' in pressure castings. The Maritime Commission has changed propeller shaft sleeves from 'G' to 'M'.

"More recently the Navy has pointed out the possibilities of the use of 85-5-5-5 instead of 'M', 'G' or silicon bronze for sea water valves and fittings.

"Possible design changes are shown on the chart and those which are currently most desirable are indicated by the use of heavier connecting lines. Results to date have been very encouraging. The actual saving in primary copper by specification changes is already measured in terms of thousands of tons per month."

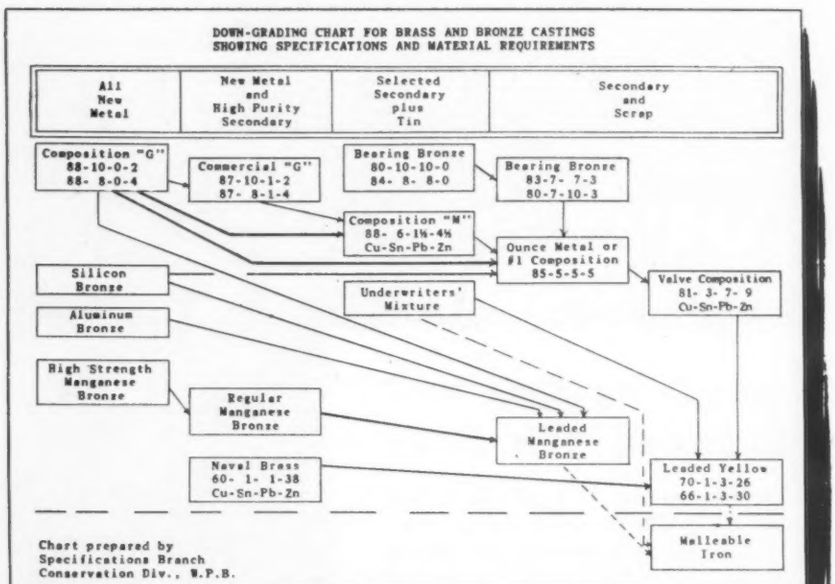

DOWN-GRADING CHART FOR BRASS AND BRONZE CASTINGS
SHOWING SPECIFICATIONS AND MATERIAL REQUIREMENTS
All New Metal
New Metal and High Purity Secondary
Selected Secondary plus Tin
Secondary and Scrap
Composition "G" 88-10-0-2 88- 8-0-4
Commercial "G" 87-10-1-2 87- 8-1-4
Bearing Bronze 80-10-10-0 84- 8- 8-0
Bearing Bronze 83-7- 7-3 80-7-10-3
Composition "M" 88- 6-1½-4½ Cu-Sn-Pb-Zn
Ounce Metal or #1 Composition 85-5-5-5
Valve Composition 81- 3- 7- 9 Cu-Sn-Pb-Zn
Silicon Bronze
Aluminum Bronze
Underwriters' Mixture
High Strength Manganese Bronze
Regular Manganese Bronze
Leaded Manganese Bronze
Naval Brass 60- 1- 1-38 Cu-Sn-Pb-Zn
Leaded Yellow 70-1-3-26 66-1-3-30
Malleable Iron

Chart prepared by Specifications Branch Conservation Div., W.P.B.

SPECIFICATIONS.

ALLOY	ASTM	ARMY & FEDERAL	NAVY	AMS	SAE
Composition "G"	B 143, 1A & 1B B 60	QQ-B-691a - 5	46M 6g "G"	4845 A	62
Commercial "G"	B 143, 2B E-B 143, 2X	QQ-B-691a - 6	46B 5h "P-c"		
Composition "M"	B 143, 2A B 61	QQ-B-691a - 1	46B 8g "M"		
85-5-5-5	B 145, 4A B 62	QQ-B-691a - 2	46B23c "Oz-c"		40
81-3-7-9	B 145, 5A	QQ-B-691a -11	46B24d		
80-10-10	B 144, 3A			4842	64
84- 8- 8	E-B 144, 3Y	QQ-B-691a - 8	46B22d "II"		
83- 7- 7-3	B 144, 3B	E-QQ-B-691a - 8			660
80- 7-10-3	E-B 144, 3X				
Naval Brass	B 146, 6C	QQ-B-621 - A	46B10f "N-c"		
70- 1- 3-26	B 146, 6A E-B 146, 6X & 6Y	E-QQ-B-621 X & Y			
66- 1- 3-30	B 146, 6B	QQ-B-621 - B	46B11f "		41
Silicon Bronze		QQ-C-593	46B28		
Aluminum Bronze	B 148, 9A & 9B	QQ-B-671a	46B18c		68
Underwriters' Mixture		WW-C-621a	34F 3c		
H. S. Manganese	B 147, 8B	QQ-B-726b B & C	46B29 "MA-c"	4862	
Regular Manganese	B 147, 8A	QQ-B-726b - A	49B 3e "Mn-c"	4860	43
Leaded Manganese	B 147, 7A	E-QQ-B-726b - A			

NOTE: Specifications, as shown, are approximately equivalent but may not in all cases be interchangeable for procurement and inspection.

January 1, 1943

Lead Price Revisions

• • • **Revision and amendment** of the price regulation for scrap lead and secondary lead and amendment of the price schedule for primary lead, were announced Jan. 15.

Three corresponding changes were made in each regulation: (1) The premium allowed smelters over the pig price, for ingots, linked ingots, and billets, was made uniform for primary lead, high-grade secondary lead, low-grade secondary lead, and antimonial lead. This is now 25c. a cwt. Formerly it ranged from 25c. for low-grade lead to 50c. for high-grade secondary lead and primary lead. Other shapes, not covered specifically, may be sold at customary differentials above the pig price, but their ceiling prices must be submitted to OPA for approval. (2) Seven additions are made to price basing points. These are Jacksonville, Fla., Tampa, Fla.,

Davenport, Iowa, Glens Falls, N. Y., Jacksonville, N. C., Pensacola, Fla., and Charleston, S. C. Reduction in basing point prices is made for Macon, Ga., Granite City, Ill., New Orleans, La., Hattiesburg, Miss., Neosho, Mo., and for the cities in the Pittsburgh area. In the Pittsburgh area the reduction is from 6.55c. a lb. to 6.50c. a lb. (3) Plumbing houses are permitted to determine maximum lead sales prices by adding to the cost of the material the percentage of markup obtained Oct. 1, 1941, sales and deliveries.

•

OPA Adjusts Prices of Magnesium Scrap and Remelt

• • • **Specific dollars and cents** maximum prices for magnesium scrap and remelt magnesium ingot were established Jan. 14 by OPA. The new regulation which is designed to supplement a recent WPB order requiring the segregation of such scrap is based upon prices prevailing in October, 1941, and March, 1942, but modifies and adapts those prices so as to supplement the WPB's segregation program.

Prices of these materials have previously been fixed under the general maximum price regulation at the highest price charged by the seller during March, 1942. The new regulation is necessary, OPA officials said, because March prices no longer afford an adequate basis for pricing the various types of this material which will result from the WPB's segregation order.

Magnesium scrap heretofore sold has seldom been segregated as to alloy and has been; to a considerable extent, contaminated with other metals. The ingot produced from unsegregated scrap has been far below the specifications of any of the standard commercial alloys and, therefore, has not been suitable for direct use.

Non-Ferrous Prices

(Cents per lb. for early delivery)

Copper Electrolytic, Conn. Valley	12.00
Copper Electrolytic, New York	11.75
Copper, Lake	12.00
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67
Lead, St. Louis	6.35
Lead, New York	6.50

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 15c.-16c. a lb.; No. 12 remelt No. 2, standard, 14.50c. a lb. NICKEL electrolytic, 35c.-36c. a lb. base refinery lots of 2 tons or more. ANTIMONY, prompt: Asiatic, nominal, New York: American, 14.50c. a lb., f.o.b. smelter. QUICKSILVER, $197 to $199 per 76 lb. flask, f.o.b. shipping point. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

HEAT-TREATED STEEL SHOT

We manufacture shot and grit for endurance

A shot or grit that will blast fast with a clean finish.

This is the only reason why so many operators are daily changing to our shot and grit, from Maine to California.

The unprecedented demand for our—

Heat-Treated Steel Shot and Heat-Treated Steel Grit

has enabled us to expand our production and maintain a quality that is more than satisfactory to our hundreds of customers all over the country.

•

HARRISON ABRASIVE CORPORATION

Manchester, New Hampshire

HEAT-TREATED STEEL GRIT

WE PUT THE KIDS
TO BED IN 1865!
Atop the roof of the Dunbar spring plant is perched a bell... summoning the workers in the morning... sending them home at night. This bell also performs a community service... for, rung 99 times at nine in the evening, it sends all children home and to bed. The bell still rings... the tradition almost forgotten. But the tradition of fine workmanship still goes on in the hands of another generation of springmakers, whose talents are actively engaged in helping to meet the crisis of 1942.
1865
SINCE 1845
1942

Dunbar Bros. Co., Bristol, Connecticut

DIVISION OF ASSOCIATED SPRING CORPORATION

SCRAP

. . . Market Activities and Quotation Trends

Price Changes Bring Favorable Expressions

• • • **The recent** price changes in unprepared scrap brought about through an amendment to price schedule No. 4 are fostering a favorable reaction in many sections of the scrap trade and a considerable advantage is claimed by those who were heretofore at a disadvantage in competition with some steel mills. In spite of this favorable reaction, still other phases of the industry are expressing disappointment over the failure of turnings and borings to move even at the reduced prices set up for them. Thus while the price change in general is hailed as a move in the right direction some rough spots are still to be smoothed over.

The supply situation in most localities seems to be easy at the present time, or at least not in any position of imminent difficulty even though snow and cold weather in some sections has slowed movement both into and out of yards to the point where some consumers are eating into inventories. Cast grades are rather generally in poor demand. Canada, of course, is practically snowed-in and with generally bad weather is complaining of slow movement. This, however, may not be serious in itself as the current steel strike there far overshadows any difficulty with scrap.

WPB makes it known that the steel warehouse salesmen who have done such a brilliant job of getting out dormant scrap in cooperation with WPB and with the help of steel company salesmen and sales executives have launched a new campaign to last for the duration. Their last drive encompassed the last three months of the past year and was quite productive.

For convenience and efficiency in buying

...GET BOTH FROM THE SAME SOURCE

Cleveland Cap Screws

***SAE 1035 Heat Treated*—for maximum tensile strength with good appearance.**

***Full Finished*—for bright full finish with adequate tensile strength.**

All made by the famous Kaufman Process; stocked in all standard sizes. Write for samples and prices.

Convenient warehouse stocks.

THE CLEVELAND CAP SCREW CO.
2917 EAST 79th STREET • CLEVELAND, OHIO

Cleveland Cap Screws
Set Screws and Special Upset Parts
Made by the Originators of the Kaufman Process for Greater Strength and Accuracy
Specialists for 26 years in Headed and Threaded Products

WAREHOUSES
CHICAGO: 726 W. Washington Blvd.
PHILADELPHIA . . 12th & Olive Sts.
NEW YORK. . . . . 47 Murray St.
LOS ANGELES . . . 1015 E. 16th St.

Scrap Stockpiling Considered by MRC

Washington

• • • **Serious consideration** is being given by the Metals Reserve Corp. to suggestions made by the WPB Conservation Division for the purchase and stockpiling of excess scrap on the West Coast. WPB officials estimate that more than 30,000 tons of scrap monthly are being generated by West Coast industries. Only a fractional part of this finds any use there. Proposals have been made that MRC finance a transportation subsidy to get the scrap to the eastern mills. OPA is said to oppose the subsidy for shipping scrap to eastern steel companies.

Complaint has been made because scrap dealers have in many instances refused to purchase "Victory Drive" scrap. Shortage of manpower to assist in scrap preparation plus the fact that scrap supply is definitely easier is said to be the reason. A WPB spokesman placed scrap inventories as of Dec. 1 at 5,500,000 tons. Approximately 2,000,000 tons of purchase scrap is consumed monthly.

•

NEW YORK—Considering the time of year and the cold weather, the flow of scrap is quite good. Dealers estimate that now 75 to 80 per cent of shipments in this district are going on allocation to western mills. Dealers here are dubious about how the new regulations affecting turnings prices will work out, but are agreed that the differential established between cleaned and dirty motor blocks is reasonable and unlikely to be troublesome.

•

CHICAGO—The continued cold weather has cut sharply into the movement of scrap to consumers and most mills in this area have been forced to eat into reserves. However, the situation is not yet serious, but a prolongation of the cold weather could easily develop a critical situation again.

•

ST. LOUIS—Allocations of 30,000 tons of scrap iron between Granite City Steel Co. and Laclede Steel Co., with the material coming from the Southwest helped to relieve their inventory situation. Because of cold weather and shortage of labor here and in the producing territory a little ground is being lost despite these allocations.

•

PHILADELPHIA — The surplus of nickel turnings, noticeable for some weeks, has given way to a surplus of all

turnings. It is believed the lowered price on bushy turnings will give mills more incentive to buy. It is also believed by some persons that a few mills may not buy shoveling turnings, hoping to continue to get a mixture of shoveling and bushy turnings, much as before at the new lower price. Heavy breakable cast remains scarce, but low phos grades are in better shape.

o

BOSTON—All prepared scrap is temporarily in small supply due to weather conditions. Low temperatures have frozen yard stocks, lowered efficiency of yard workers and delayed car loadings. Tightness of gasoline supplies has curtailed truck deliveries. Production of turnings and stampings in certain localities has been cut some due to a contraction in number of hours labor can be worked, and forced plant closings based on skimpy heating oil supplies.

o

CINCINNATI — Recent releases from schedules of certain items and changes of allowance for preparation has assisted district dealers very much. Present steps being taken by Washington for moving various grades which are now being over-produced also adds optimism to the local market. The attitude of officials to get the right scrap at the right place at the right time is assisting very much and dealers generally are hailing present moves as being definitely in the right direction. Local users of old materials are in reasonably comfortable positions in most instances.

o

DETROIT—Abnormally heavy falls of snow last week throughout Michigan brought scrap movement to a dead stop and all mills had to draw on inventories, with receipts negligible. Continued cold weather after the snowfall kept the ground heavily covered and scrap men expected that receipts would continue at bottom levels for at least another week or two.

o

BUFFALO — Despite the lowering of prices on turnings and borings, scrap yard operators complained this week that mills still were refusing to buy. Disappointment was pronounced over the failure of Washington to make arrangements under which mills would be obliged to accept some turnings and borings at the reduced price. Temperatures close to zero made the week a dull one for all yards, with little moving in or out. Mill stocks remain in good shape.

o

BIRMINGHAM—The grade of scrap dealers are shipping has shown some improvement in this district. Supplies remain plentiful and dealers are having continued difficulty in disposing of cast grades.

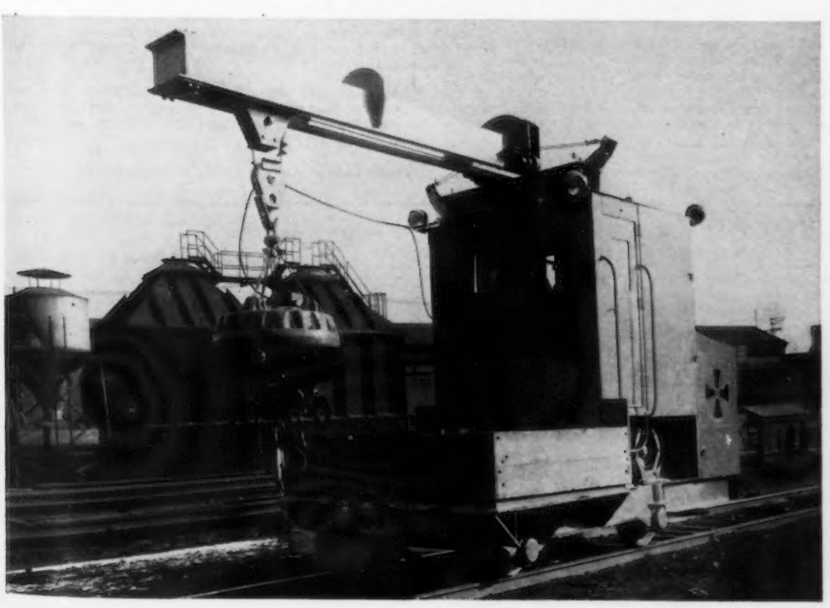
o

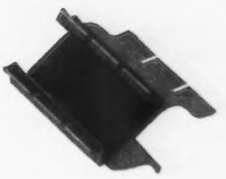
PITTSBURGH — Supplies are flowing fairly easily owing to milder weather. There have been no tight spots in the past week. The change in price of unprepared scrap has helped yard dealers considerably in obtaining this type of material. Heretofore they were at a competitive disadvantage with some steel mills. So far the change in the turning price has had little effect on these grades but it is too early yet to determine the full outcome of the revisions.

o

TORONTO—Sub-zero weather with further heavy snow falls throughout Ontario and Quebec practically suspended all movement of scrap iron and steel during the past week or ten days. Steel mills and other consumers are forced to depend on their own stocks for daily needs. While mills report no shortage, the situation in foundries is becoming serious. Practically no iron scrap is available.

SCRAP PICKER PICKS FOR SIX MEN: A self-powered magnetic scrap picker, designed and constructed by the Timken Roller Bearing Co. from odds and ends, was placed in operation recently and is doing the work of six men gathering up scrap in the company's railroad yards.





. . . and hoist the ammunition!

Pictured above is the moving spring contact used in the new BullDog Vacu-Break safety switches which help make our naval firepower so devastating. Once they are engaged only their manual release can disrupt the even flow of electrical energy.

These small metal parts are but one of hundreds of microscopically accurate stampings which we are producing. What can we do to help *you* make victory certain?

Write, wire or better still . . . phone us!

AMERICAN SPRING OF HOLLY, INC.
HOLLY, MICHIGAN

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES			ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES									
						Low Phos.		Heavy Structural and Plate			Foundry Steel				
	No. 1 Hvy. Melting; No. 1 Hydr. Comp. Black Sheets; No. 2 Hvy. Melting; Dealers' No. 1 & No. 2 Bundles; No. 1 Busheling	Mixed Borings and Turnings Unbaled* Machine Shop Turnings	No. 2 Busheling; Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings, Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	....	12.85	13.85	14.85	15.35	....	....	....	....	....	....	....	....	....	....	....
St. Louis, Mo.	17.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburg, Cal.; San Francisco	17.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	10.50	11.50	12.00	19.00	17.00	16.00	16.50	17.00	16.00	16.00	15.00	12.50	14.00	15.50

*Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK city or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.65 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshohocken, 11c.; Atlanta, Birmingham, 32c.; Pittsburg, Cal., 42c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 84c.; Detroit, 53c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c. *At Cincinnati, for basic open hearth grades, cut auto scrap and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport, Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakland, Cal.

MAXIMUM prices of inferior grades shall continue to bear same differential below corresponding grades as existed during the period Sept. 1, 1940, to Jan. 31, 1941. Superior grades cannot be sold at a premium without approval of OPA. Special preparation charges in excess of the above prices are banned. Whenever any electric furnace or foundry grades are purchased for open hearth or blast furnace use, prices may not exceed the prices above for the corresponding open hearth grades.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad car or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. In lieu of dock charge add 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less the maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge $2.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared scrap is provided.

Maximum price of all scrap in a vehicle is that of the lowest price grade in the shipment. This limitation does not apply to vessel shipments if grades are segregated.

Where scrap is to undergo preparation prior to its arrival at the point of delivery, such scrap is not at its shipping point, as that phrase is defined above, until after preparation has been completed. For special preparation charges, consult official order.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c.

UNPREPARED CAST IRON SCRAP—Except for heavy breakable cast, unprepared scrap is given a price ceiling of $2.50 per ton less than the maximum prices for the corresponding grade of prepared cast iron scrap. Where scrap is to undergo preparation prior to arrival at the point of delivery, such scrap is not considered at shipping point until preparation is completed.

Consumers of cast scrap may pay the shipping point price plus established charge for transporting the scrap to their plants. In the case of deliveries by truck, the cast scrap buyer must obtain from the seller a certification, made out to OPA.

*At Memphis 50c.; Great Lakes ports $1; New England $1.25.

RAILROAD SCRAP

	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	Scrap Rails: 3 ft. and Under	Scrap Rails: 2 ft. and Under	Scrap Rails: 18 in. and Under
Cleveland, Cincinnati, Ashland, Portsmouth, Middletown	$20.50	$21.50	$23.00	$23.50	$23.75	$24.00
Canton, Pittsburgh Sharon, Steubenville, Wheeling, Youngstown	21.00	22.00	23.50	24.00	24.25	24.50
Chicago, Philadelphia, Sparrows Pt., Wilmington	19.75	20.75	22.25	22.75	23.00	23.25
Birmingham, Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
Kokomo, Ind.	19.25	20.25	21.75	22.25	22.50	22.75
Seattle	15.50	16.50	18.00	18.50	18.75	19.00
St. Louis	18.50	19.50	21.00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group
No. 1 cupola cast	$18.00	$19.00	$20.00
Clean auto cast	18.00	19.00	20.00
Unstripped motor blocks	15.50	16.50	17.50
Stove Plate	17.00	18.00	19.00
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Misc. Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas Oklahoma, Texas and Florida.

Group C: States not named in A and B; switching district of Kansas City, Kan., Mo.

U. S. Steel Earnings Show Drop from 1941

New York

• • • **Net income** for U. S. Steel Corp. for the fourth quarter of 1942 amounted to $25,646,452 after tax liabilities and various year end adjustments. The net for the fourth quarter was $2.23 per share of common stock. Earnings of the common per share for the year 1942 were equivalent to $5.39.

Net income for 1942 was $72,142,195 against $116,171,075 in 1941. Shipments of finished steel in 1942 were 21,064,157 net tons, a new record, and were 3.2 per cent ahead of 1941.

C-I Workers Walking to Work

• • • **One-third** of the employees of Carnegie-Illinois Steel Corp. in the Pittsburgh district walk to work, according to a transportation survey recently conducted. Another one-third depend upon public transportation and the remainder upon private automobiles.

Basing Point Established For Pig Iron at Provo, Utah

Washington

• • • **Because basic pig** iron is about to be sold commercially from Provo, Utah, for the first time, OPA on Tuesday established a basing point price for Provo of $21.50 per gross ton, effective Feb. 1. This is 50c. below the already established price at Provo for No. 2 foundry and bears the same relation to the latter price as in effect between the two at nearly all basing points. Action was taken because the blast furnace of Columbia Steel Co., San Francisco, a United States Steel Corp. subsidiary, transferred to Ironton, Utah, from Juliet, Ill., is expected to be in operation in February. Provo is the shipping point for Ironton.

Iron Situation Aided by CMP

Cleveland

• • • **Pig iron** supplies are freer at the present time, says an official of one of the district's largest producers. The Controlled Materials Plan is credited with being a factor in bringing about this condition. While CMP does not cover pig iron directly, since the plan was first made known to manufacturers, greater attention has been directed to keeping inventories of iron more liquid and much of the over-ordering prevalent during the first half of 1942 has disappeared.

Cleveland Clamps Down On Migratory Job Seekers

Cleveland

• • • **Setting** a national precedent and serving notice that unskilled workers are not wanted, Cleveland this week clamped down on the influx to an already crowded city of people hunting jobs in war plants. Regulations to govern the hiring of job applicants from outside the Cleveland area were announced by the U. S. Employment Service following approval by the War Manpower Commission. The plans were inaugurated to protect Cleveland labor and to prevent an uncontrolled influx of families that might become public wards after the war.

Terms of the new policy include: (1) The hiring of applications outside the local area through U. S. Employment Service only; (2) A ban against hiring immigrants unless USES rules that they possess skills badly needed; (3) Requiring all immigrants to obtain a "memorandum of clearance" from USES; (4) Prohibiting the employment in any job other than a Cuyahoga County farm job of agricultural workers; (5) Distinguishing between job-seekers living within commuting distance of Cleveland industries and those who now live beyond that distance.

•

Inventories in South Improve

Birmingham

• • • **The improved** system of controlling distribution of steel on the part of the War Production Board has manifested itself in a better balancing of inventories on hand at shipyards and defense plants in this region. The improvement is finally making a little more material available for jobbers so that they can take care of smaller requirements out of warehouses.

•

Valley Furnace Resumes

Youngstown

• • • **The only idle** blast furnace, a stack at Republic Steel Corp.'s Youngstown works, went back in blast during the past week end, bringing iron production back to capacity in the district. The furnace has been down since mid-December for relining.

MAKERS OF WAR PLANES: J. H. Kindelberger, president of North American Aviation, confers with R. H. Rice, vice-president in charge of engineering; J. S. Smithson, vice-president in charge of manufacturing; R. A. Lambeth, vice-president and treasurer; and J. L. Atwood, executive vice-president. The men are shown from left to right.

Wide World

Comparison of Prices . . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	Jan. 26, 1943	Jan. 19, 1943	Dec. 28, 1942	Jan. 27, 1942
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Jan. 26, 1943	Jan. 19, 1943	Dec. 28, 1942	Jan. 27, 1942
No. 2 fdy., Philadelphia	$25.89	$25.89	$25.89	$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	24.68	24.68	24.68	24.06
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.39	25.39	25.39	25.34
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	31.34	31.34	31.34	31.34
Ferromanganese‡	135.00	135.00	135.00	120.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melting steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	23.00
No. 1 cast, Pittsburgh	20.00	20.00	20.00	22.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	24.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$6.00	$6.00	$6.00	$6.125
Foundry coke, prompt	6.875	6.875	6.875	6.875
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	5.70
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 116, 118 and 120.

Composite Prices . . .

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Jan. 26, 1943	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1942	2.30467c.,	2.30467c.,	$23.61	$23.61	$19.17	$19.17
1941	2.30467c.,	2.30467c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 9
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99629c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Prices of Finished Iron and Steel...

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, reductions, and in most cases freight absorbed to meet competition. Delivered prices do not reflect new 3 per cent tax on freight rates.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars[10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.22¢	2.35¢	2.28¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.17¢	3.41¢	3.39¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.75¢	3.68¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.47¢	3.73¢	3.69¢
Long ternes[2]	3.80¢		3.80¢									4.55¢		4.18¢	4.14¢
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.22¢	2.48¢	
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.92¢	3.18¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.58¢	
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.07¢	3.33¢	
TIN MILL PRODUCTS															
Coke tin plate, base box	$5.00	$5.00	$5.00						$5.10					5.38¢	5.34¢
Electrolytic tin plate, box	$4.50		$4.50												
Black plate, 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.39¢
Mfg. ternes, special box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.52¢	2.80¢	2.27¢	2.51¢	2.49¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.52¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.52¢	2.55¢[13]	2.27¢	2.40¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.52¢	2.55¢[13]	2.27¢		2.49¢
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70c)					3.01¢	2.99¢
Alloy, hot rolled	2.70¢	2.70c				2.70¢		Bethlehem, Massillon, Canton = 2.70c)					2.82¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.47¢		
								(Coatesville and Claymont = 2.10¢)							
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.25¢[11]		2.47¢	2.65¢	2.33¢	2.30¢	2.155¢
Floor plates	3.35¢	3.35¢									3.72¢	4.00¢		3.73¢	3.69¢
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.97¢	4.15¢		3.71¢	3.60¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.47¢	2.75¢		2.28¢	2.22¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70c)					3.10¢			2.94¢
Galvanized	add proper size extra and galvanized extra to bright wire base, above.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.54¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.74¢

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to certain width and length limitations. [6] For merchant trade. [7] Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lot to manufacturing trade. [10] These prices do not apply if the customary means of transportation (rail and water) are not used. [11] Ship plates only. [12] Boxed. [13] Portland and Seattle price, San Francisco price is 2.50c. [14] This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

GOVERNMENT CEILINGS—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices, which are on another page of this issue.

EXCEPTIONS TO PRICE SCHEDULE No. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote 2.35c. at established basing points; Calumet Steel division of Borg Warner may quote 2.35c., Chicago, on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.33c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote for shipment to Detroit area on Middletown base. On galvanized sheets, Andrews Steel may quote 3.75c., at established basing points. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote 2.30c. established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all-rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. SEMIFINISHED STEEL—Follansbee Steel Corp. may sell forging billets at $49.50 f.o.b. Toronto; Continental Steel Corp. may sell Acme Steel Co. at $34 for rerolling billets plus extras and freight; Ford Motor Co. may sell rerolling billets at $34 f.o.b. Dearborn; Andrews Steel Co. may sell forging billets at $50 at established basing points and slabs at $41; Empire Sheet and Tin Plate may sell slabs at $41 at established basing points and sheet bars at $39 f.o.b. mill; on lend-lease sales Northwestern Steel & Wire Co. may charge $41 per gross ton f.o.b. mill for rerolling billets; on lend-lease sales Wheeling Steel Corp. may charge $36 per ton for small billets, f.o.b. Portsmouth and $37 per ton for sheet bars f.o.b. Portsmouth; Laclede Steel Co. on semifinished sales for lend-lease shipped to eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. ALLOY STEEL BARS—Texas Steel Co. may use Chicago base f.o.b. Fort Worth.

SEMI-FINISHED STEEL

For exceptions, see preceding page

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.25 higher; f.o.b. Duluth, billets only, $2 higher. Delivered prices do not reflect new per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00
Alloy Steel: Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton	$54.00

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.25 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi, 3c. higher.

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hotstrip	17.00c.	17.50c.	24.00c.	35.00c.
Cold st.	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

NATIONAL EMERGENCY STEELS (Hot Rolled)

Extras for Alloy Content

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar Strip	Billets, Blooms and Slabs	Bars and Bar Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35				.10c	$2.00		
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 8020	.18/ .23	1.00/1.30	.040	.040	.20/ .35			.10/ .20	.45	9.00	.95c	$19.00
NE 8442*	.40/ .45	1.30/1.60	.040	.040	.20/ .35			.30/ .40	.90	18.00	1.40	28.00
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	20/ 30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20				.40c	8.00		
NE 9260	.55/ .65	.75/1.00	.040	.040	1.80/2.20				.40	8.00		
NE 9262	.55/ .65	.75/1.00	.040	.040	1.80/2.20	.20/ .40			.65	13.00		
NE 9415	.13/ .18	.80/1.10	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30c	$26.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.85	17.00	1.35	27.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.85	17.00	1.35	27.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.85	17.00	1.35	27.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ 25	1.20	24.00	1.70	34.00
NE 9630	.28/ .33	1.20/1.50	.040	.040	.40/ .60	.40/ .60			.80	16.00	1.30	26.00
NE 9635	.33/ .38	1.20/1.50	.040	.040	.40/ .60	.40/ .60			.80	16.00	1.30	26.00
NE 9637	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60			.80	16.00	1.30	26.00
NE 9640	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60			.80	16.00	1.30	26.00
NE 9642	.40/ .45	1.30/1.60	.040	.040	.40/ .60	.40/ .60			.85	17.00	1.35	27.00
NE 9645	.43/ .48	1.30/1.60	.040	.040	.40/ .60	.40/ .60			.85	17.00	1.35	27.00
NE 9650	.48/ .53	1.30/1.60	.040	.040	.40/ .60	.40/ .60			.85	17.00	1.35	27.00

***Recommended for large sections only.**

Note: The extras shown above are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)	*Per Lb.*
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cutnails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
Annealed galvanized fence wire	3.40
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., gross ton	$40.00
Angle bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing Points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

MAINTAINED PEAK OUTPUT

proves dependability of Armstrong's Refractories

TO meet today's war production demands a furnace must operate efficiently and without interruption, month after month. The durability and dependability of Armstrong's Insulating Fire Brick are helping many furnaces to meet these requirements. The high insulating efficiency of these brick is backed up by rugged strength which assures long service and aids sustained output.

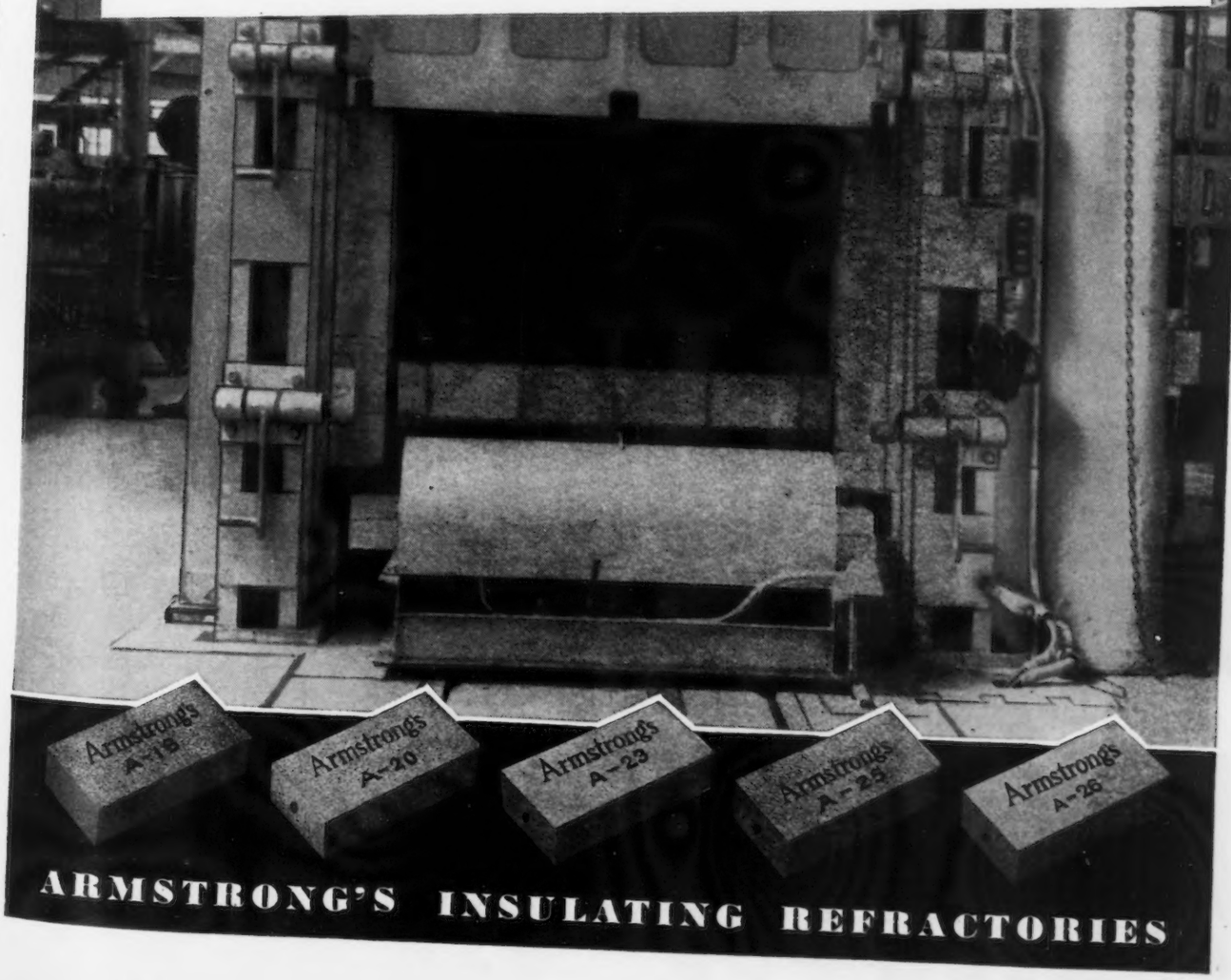
Five types of Armstrong's Insulating Brick (for temperatures from 1600° to 2600° F.) are on the job. All have the following physical characteristics which make them ideally suited to most furnace applications.

High Insulating Efficiency: These brick effectively bar heat loss. They aid in accurate heat control and thus help insure uniform, high quality production.

High Physical Strength: Every Armstrong's Brick, though light in weight, is highly resistant to spalling, has exceptional crushing and breaking strength (hot and cold) and ample refractoriness for the use intended.

Low Heat Storage: These lightweight refractories heat and cool quickly—speed cycles in intermittent type furnaces—cut fuel costs per cycle.

If you want refractories that are tough, efficient, and thoroughly dependable, get the facts about Armstrong's Insulating Fire Brick. Armstrong Engineers will help you choose the right brick and the right cement for maximum operating and combustion efficiency. Write to Armstrong Cork Company, Insulating Refractories Dept., 4901 Concord St., Lancaster, Pa.



ARMSTRONG'S INSULATING REFRACTORIES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

	Per Cent off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	**U.S.S.**	**S.A.E.**
7/16 in. and smaller		64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove Bolts

Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets (½ *in. and larger*)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets (7/16 *in. and smaller*)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

	Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect new 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston††	***$25.53***	***$25.03***	***$26.53***	***$26.03***	.....	.....
Brooklyn	***27.65***	.....	.....	***28.15***	.....	.....
Jersey City	***26.62***	***26.12***	***27.62***	***27.12***	.....	.....
Philadelphia	***25.89***	***25.39***	***26.89***	***26.39***	.....	.....
Bethlehem, Pa.	**$25.00**	**$24.50**	**$26.00**	**$25.50**	.....	.....
Everett, Mass.††	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	**$29.50**	.....
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa.*	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati	***24.68***	***24.68***	.....	***25.18***	.....	.....
Canton, Ohio	***25.47***	***24.97***	***25.97***	***25.47***	.....	.....
Mansfield, Ohio	***26.06***	***25.56***	***26.56***	***26.06***	.....	.....
St. Louis	***24.50***	***24.00***	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	.....	..... *$31 34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	.....	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown*	24.00	23.50	24.50	24.00	.....	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	**$28.00**
Lyles, Tenn. fc.†	.....	.....	.....	.....	.....	33.00
St. Paul	***26.76***	.....	***27.26***	***26.76***	.....	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	***27.25***	.....	.....	.....	.....	.....
San Francisco	***27.25***	.....	.....	.....	.....	.....
Seattle	***27.25***	.....	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....	.....
Montreal	***27.50***	***27.50***	.....	***28.00***	.....	.....
Toronto	***25.50***	***25.50***	.....	***26.00***	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace..... **$23.50**

*Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

**Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

†Price shown is for low-phosphorous iron; high-phosphorous sells for $28.50 at the furnace.

††Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at $1 per gross ton above maximum prices.

Delta Chemical & Iron Co., Chicago, may charge $30 for charcoal iron at its Delta, Mich., furnace.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 per cent to 2.25 per cent); phosphorous differentials, a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over; manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent.

WAREHOUSE PRICES *(Delivered Metropolitan areas, per 100 lb. These prices do not necessarily apply for dislocated tonnage shipments when the f.o.b. City prices are used in conformance with OPA Schedule 49)*

CITIES	SHEETS			STRIP		Plates (¼ in. and heavier)	Structural Shapes	BARS			ALLOY BARS		
	Hot Rolled (10 ga.)	Cold Rolled	Galv. (24 ga.)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled 2300	Hot Rolled 3100	Cold Drawn 2300	Cold Drawn 3100
Pittsburgh	$3.35	†4.00	$4.75	$3.60	$3.20	$3.40	$3.40	$3.35	$3.65	$7.45	$5.75	$8.40	$6.75
Chicago	3.25	4.10	4.85[1]	3.60	3.50	3.55	3.55	3.50	3.75	7.35	5.65	8.40	6.75
Cleveland	3.35	4.05	4.62	3.50	3.20	3.40	3.58	3.25	3.75	7.55	5.85	8.40	6.75
Philadelphia	3.55	4.63	4.90	3.95	3.31	3.55	3.55	3.85	4.06	7.31	5.86	8.56	7.18
New York	3.58	4.60[2]	5.00	3.96[6]	3.51	3.76	3.75	3.84	4.09	7.60	5.90	8.84	7.19
Detroit	3.43	4.30	4.84[1]	3.43	3.40	3.60	3.65	3.43	3.80	7.67	5.97	8.70	7.05
Buffalo	3.25	4.30[1]	4.75[4]	3.82	3.52	3.62	3.40	3.35	3.75	7.35	5.65	8.40	6.75
Boston	3.71	4.68	5.11	4.06	3.46	3.85	3.85	3.98	4.13	7.77	6.07	8.91	7.26
Birmingham	3.45[3]	4.78	4.75[1]	3.70[3]	....	3.55[3]	3.55[3]	3.50[3]	4.43	....	....	....	....
St. Louis	3.39	4.24[2]	4.99[1]	3.74	3.61	3.69	3.69	3.64	4.02	7.72	6.02	8.77	7.12
St. Paul	3.50	4.35	5.00	3.85	3.83	3.80	3.80	3.75	4.34	7.45	6.00	8.84	7.44
Milwaukee	3.38	4.23[2]	4.98[1]	3.73	3.54	3.68	3.68	3.63	3.88	7.58	5.88	8.63	6.98
Baltimore	3.50	5.00	5.05	4.00	....	3.70	3.70	3.85	4.04	....	....	....	....
Cincinnati	3.42	4.37[2]	4.92[1]	3.67	3.45	3.65	3.68	3.60	4.00	7.69	5.99	8.50	7.10
Norfolk	3.85	4.50	5.40	4.10	....	4.05	4.05	4.00	4.15	....	....	....	....
Washington	3.60	5.10	5.15	4.10	....	3.80	3.80	3.95	4.03	....	....	....	....
Indianapolis	3.45	4.25	5.01[1]	3.75	3.28	3.70	3.70	3.60	3.97	7.67	5.97	8.72	7.07
Omaha	3.85	4.77	5.52[1]	4.20	....	4.15	4.15	4.10	4.42	....	....	....	....
Memphis	3.85	4.66	5.25	4.10	....	3.95	3.95	3.90	4.31	....	....	....	....
New Orleans	3.95	4.95	5.25	4.20	....	3.90	3.90	4.10	4.60	....	....	....	....
Houston	3.75	5.43	5.25	4.30	....	5.25	5.25	3.75	4.50	....	....	....	....
Los Angeles †	4.95	7.15	5.95	4.90	....	4.90	4.60	4.35	5.70	9.55	8.55	10.55	9.55
San Francisco †	4.55	7.55	6.60	4.50	....	4.65	4.35	3.95	5.55	9.80	8.80	10.80	9.80
Seattle †	4.65[7]	6.63	5.70[7]	4.25	....	4.75	4.45	4.20	5.75	....	8.00	....	....

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb., galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: [1] 500 to 1499 lb. [2] 400 to 1499 lb. [3] 400 to 3999 lb. [4] 450 to 1499 lb. [5] 1000 to 1999 lb. [6] 0 to 1999 lb. [7] 300 to 10,000 lb. At Philadelphia galvanized sheets, 25 or more bundles; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; San Francisco, hot rolled sheets, 400 to 39,999 lb., galvanized and cold rolled sheets, 750 to 4999 lb., cold fin. bars, 0-299 lb.; hot rolled alloy bars, 0-4999 lb.; Seattle, cold finished bars, 1000 lb. and over, hot rolled alloy bars, 0-1999 lb.; Memphis, hot rolled sheets, 400 to 1999 lb., galvanized sheets, 150 and over; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, cold rolled sheets, 300 to 1999 lb.: galvanized sheets, 1 to 6 bundles; cold finished bars, 1 to 99 lb.; SAE bars, 100 lb. Extras for size, quality, etc., apply on above quotations.

† Los Angeles, San Francisco and Seattle prices reflect special provisions of amendment No. 2 to OPA Price Schedule No. 49.